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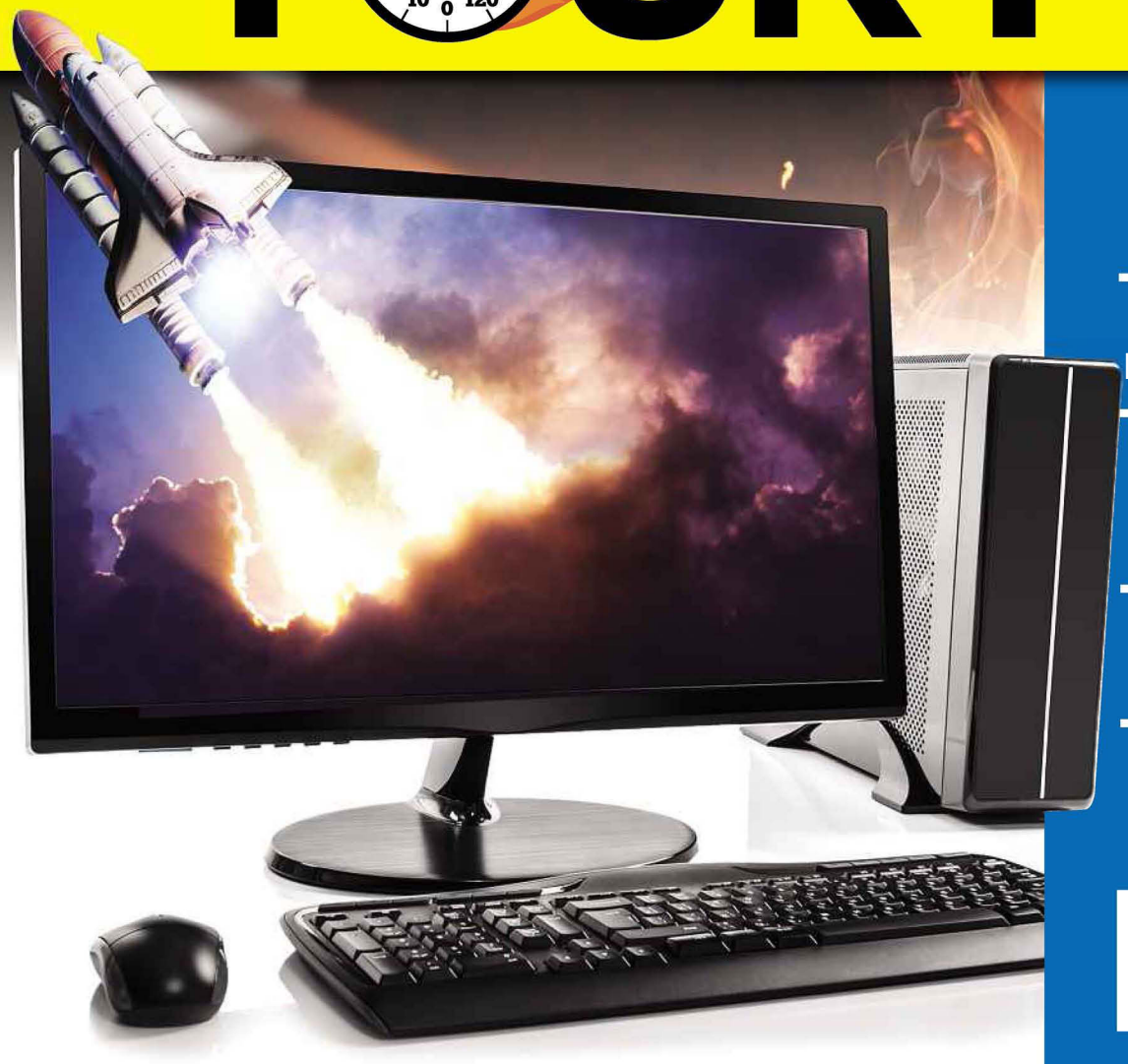
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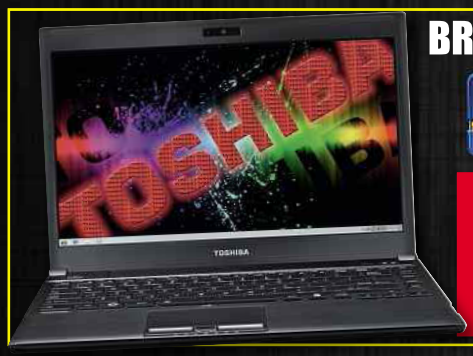
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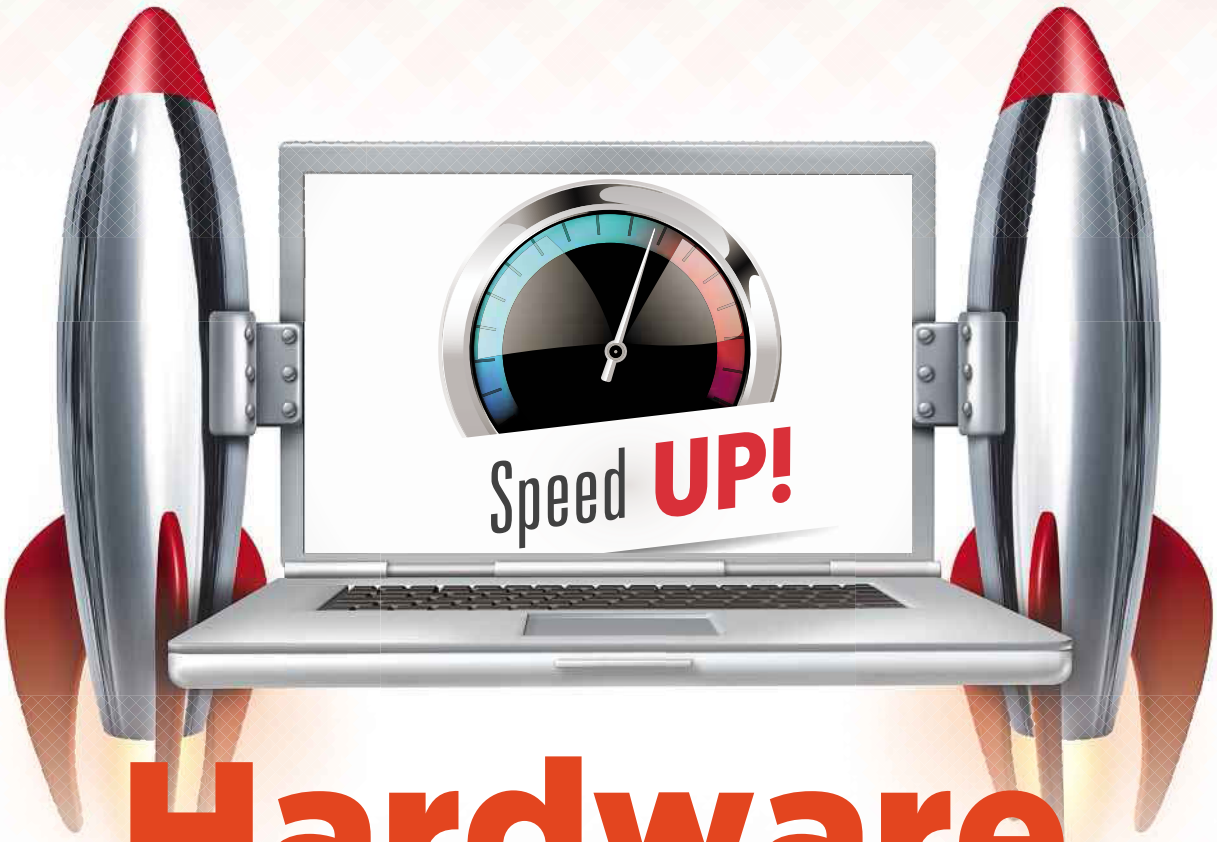
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Hardware Optimisations For A Faster System

Want your components to perform as well as they can? Read on...

Making your PC run at its optimum speed isn't just about buying the right parts. It's also about making sure the parts you buy are able to reach and then continue to exploit their full potential, whether it's been two weeks or two years since they were first installed.

Maintaining a system properly isn't difficult, but that doesn't mean it's entirely simple either. That's why we've compiled a list of our favourite hardware-based tweaks, tips and optimisations aimed at giving you the fastest PC possible.

1 Enable SSD Optimisations

You probably know that defragmenting your mechanical hard drive is going to result in improved access times, but what can you do if you're running an SSD?

To optimise your SSD, you need to do two things: make sure your SATA controller is in AHCI (Advanced Host Controller Interface) mode and enable TRIM. Here we'll tell you how and why.

AHCI is important, because it allows your SSD to take advantage of Native Command Queuing, which is a SATA-specific technology that enables it to perform operations on the command queue in parallel, rather than sequentially. Essentially it means it can do multiple jobs at once, so larger slow jobs won't hold up smaller, fast ones.

AHCI also allows Windows to support TRIM natively, which helps access speeds stay consistent as the drive ages by wiping unused sectors.

To make sure your SATA controller is set to AHCI mode, open the Windows device manager and look for the tree entry marked 'IDE ATA/ATAPI controllers'. Expand it, and look for one which lists AHCI. If it doesn't, your system isn't in AHCI mode. Note that this might be because you only have mechanical hard drives, in which case it's fine!

If you have an SSD and want to switch AHCI on, use Regedit to change the following values to '0':

```
HKEY_LOCAL_MACHINE\System\CurrentControlSet\
Services\Msahci
HKEY_LOCAL_MACHINE\System\CurrentControlSet\
Services\IastorV
```

You can then enter the BIOS and set your SATA mode to AHCI to complete the process.

Similarly, you should verify that TRIM is enabled. To do this, you need to run the command line with administrator privileges (type 'cmd' in the search box, then right-click it and select 'run as administrator') and then type the following command:

```
Fsutil behaviour query DisableDeleteNotify
```

If the value returned is 0, TRIM is enabled. If the value is 1, TRIM is disabled. If you get the latter result (and remember, this only applies if you have an SSD), then type the following command to turn it on:

```
fsutil behavior set disabledeletenotify 0
```

Your SSD should now be running at the full extent of its abilities!

2 Calibrate Your Monitor

A miscalibrated monitor isn't going to slow your system down, but it can affect your experience nonetheless. Images might be out of alignment or the wrong colour, and in the worst cases it can even affect your health by causing headaches and eye strain.

To make sure your monitor is calibrated correctly, you need to leave it switched on for 30 minutes so it's properly warmed up, and then enter the 'Display' section of your control panel.

To start with, set your monitor to its native resolution. This means that the number of physical pixels in the panel matches the number of virtual pixels on your desktop. If you run at a non-native resolution, your visuals will either be scaled up or down, leading to inconsistent line thickness and/or blurry output. If you don't know the native resolution of your monitor, it should be printed somewhere on it, but you can also Google the model number. If your monitor is at all recent, it's probably 1920 x 1080.

Next, you have to calibrate the colour. You can do this by selecting the 'Calibrate Color' option, which requires administrator privileges but is otherwise simple to do. You'll be stepped through the process of selecting the right gamma, brightness and contrast levels, and then have the chance to compare the new settings with your previous calibration to see if there's been an improvement.

"Nothing says 'hardware tweak' like getting literally hands-on"

3 Get Your Cables In Order

Nothing says 'hardware tweak' like getting literally hands-on with your hardware. In this case, sorting out your cables. The inside of a computer can quickly get messy and tangled, and dangling cables restrict airflow, collect dust and generally clog the interior of your system. In a worst case scenario they might even slip inside fans or heatsinks, impeding their efficiency.

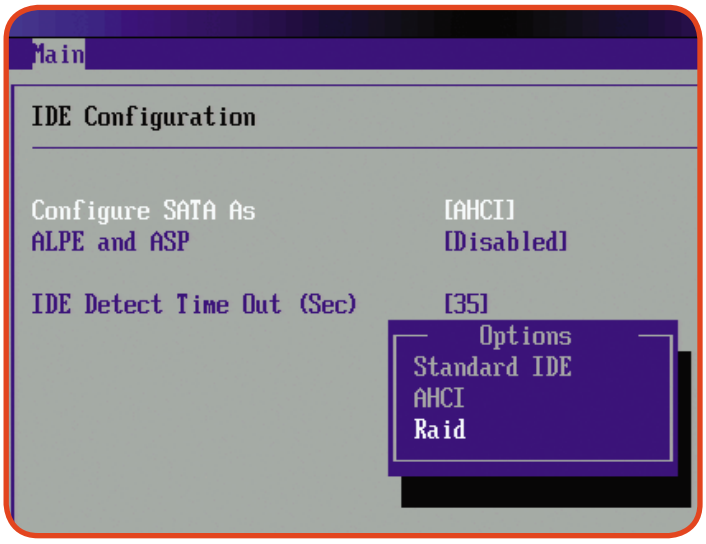
While the best time to neaten up your system is when you build it, the second best time to neaten up your system is right now. That means getting a set of cable ties so you can group power and data cables into bundles. If your case has the necessary fixtures, you can even tie them so they run clean against the case's exterior, where they're as discrete and harmless as possible.

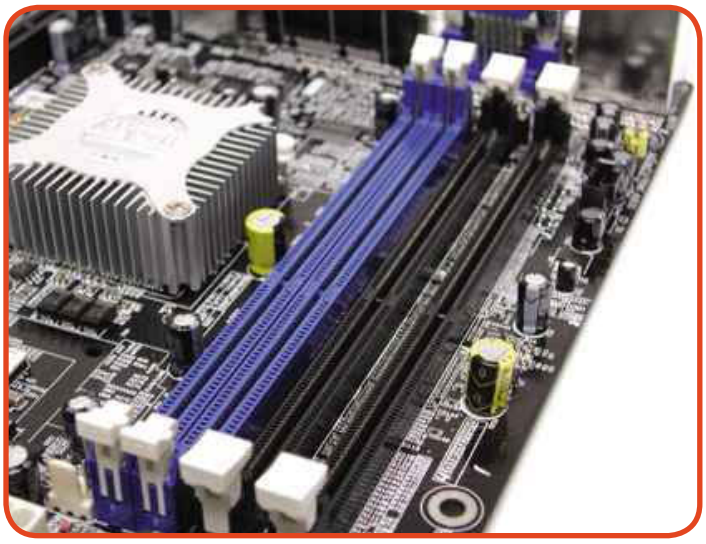
Don't be tempted to cut corners by using alternate materials, though – things like plastic tape and rubber bands will degrade in the hot, dry air inside your PC and could cause serious damage (even fires) if they crumble and come into contact with fans or components. Use durable hard-plastic cable ties only.

4 Seat Your RAM Correctly

Installing RAM seems like one of the few parts about building a PC that's impossible to get wrong. The slots are easy to access and the modules simple to seat, so what could you possibly do to improve performance? As it turns out, there are a couple of things.

First of all, if you're using single (unpaired) RAM modules, you should always order them from highest capacity to lowest,





starting with the lowest-numbered bank. Bank 0 should contain the highest-capacity module, bank 1 should be lower capacity than bank 0, and bank 2 lower than bank 1 and so on.

Except, that is, if you're using a pair of dual-channel modules. In this case, you should always keep them paired up. Treat the pair like a single module, and assume that they take priority over all other modules except higher-capacity paired modules.

So if you have one 16GB stick and two paired 4GB sticks, banks 0 and 1 should contain the paired sticks, and bank 2 should contain the 16GB stick. If you have one 16GB stick and two unpaired 4GB sticks, put the 16GB in bank 0, and the 4GB sticks in banks 1 and 2. Simple, really!

5 Make Space Between Your Components

When you're building a PC, there's no rule that says you have to clump the parts together (except in the case of RAM). For every other component, it's better to do the opposite. If you're installing multiple hard drives, SSDs, optical drives or expansion cards, it's a good idea to leave as much space between them as possible. This will give the heat generated by components more space to dissipate without negatively affecting their neighbours and minimise potential interference too.

The colder components are, the better their performance and the longer their lifespan, so there's no real downside too keeping them as far from one another as you can.

6 Upgrade Firmware On Old Components

Installing new firmware isn't the simplest process, but it's usually worth doing if your hardware is starting to feel its age. On things like optical drives and routers, new firmware can add features, iron out bugs and improve compatibility, all of which can contribute to a more robust computing experience. In some ways, upgrading the firmware makes old hardware feel like new.

Firmware downloads are normally available from the manufacturer's website, and updating your components tends to be a fairly simple process, which can be accomplished using a small applet that you'll find bundled with the download.

If you're feeling particularly adventurous, you could try using custom firmware, which might be able to remove region restrictions from DVD players or add new capabilities to your router that are unsupported by the official release.

Firmware flashing isn't for novice users (improper application could turn your hardware into little more than decorative pieces), but it's always worth investigating to see what capabilities you can add to existing hardware for free. It's a bit like updating your drivers, with a slight amount of extra jeopardy. Just don't try to upgrade with firmware designed for another device and you should find that everything runs smoothly.

7 Position Fans For Maximum Airflow

If you have a separate exhaust fan to install, don't just shove it anywhere; try to think about what the air inside your PC will be doing when all its fans are switched on.

For example, if you put an exhaust fan below the graphics card, it might counteract the graphics card's fan, rather than help it. Ideally, you want the exhaust fan positioned at the top of the case (where warm air collects) with all of the other fans blowing towards it. If you have two, devise a system that ensures they're sucking air from different places. If you're feeling especially daring, you could even add vent holes. Good airflow keeps systems cool and efficient, so take care to manage where additional fans draw air from – and where they send it!

8 Install Fan Filters

Most people don't think about the temperature inside their PC, and certainly the level of cleanliness rarely gets a look in to most people's general maintenance plans – but they can both have a definite effect on system performance. Hot components perform badly and fail more easily, and when dust builds up



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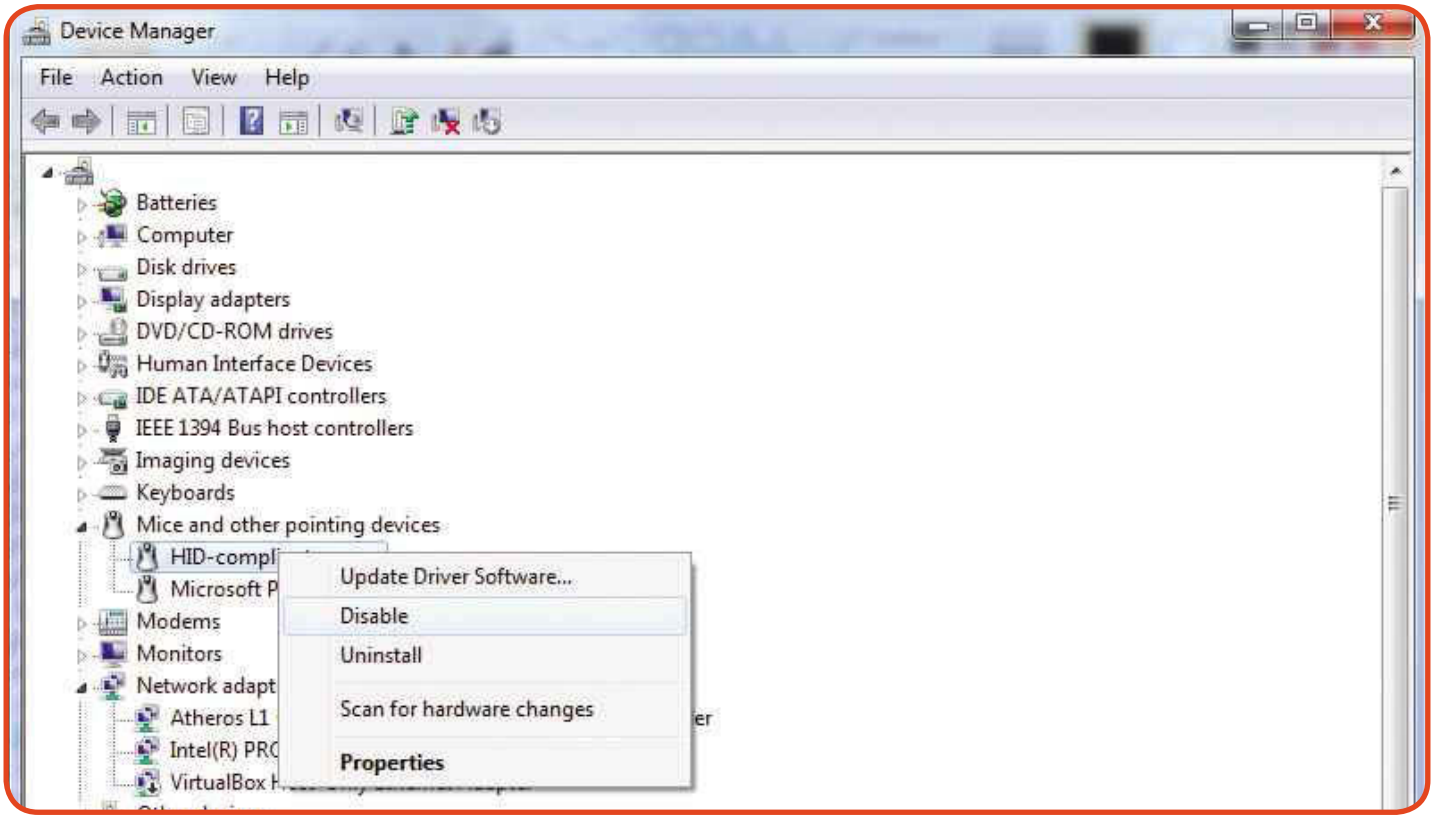
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on hardware it not only insulates that heat, it also reduces the efficiency of existing cooling measures like fans and heatsinks.

We can therefore say that adding fan and case vent filters to your system is probably a smart upgrade to make for your system, and if you've ever had a look at the thick carpet of dust inside even relatively young PCs, you'll understand why. They're cheap to buy, easy to install and remove, and the filters are washable for easy cleaning. You may need to do a little customisation so they fit properly inside your system, but it's an upgrade worth making for how they transform the task of keeping your computer clean into such an easy thing to do.

9 Disable Unwanted Devices

You can speed up your boot times by switching off peripherals that you don't want to use, and there are a few main ways to do this. The first is to enter Device Manager, find the hardware that you don't want to be accessible (for example, an on-board network controller that you've replaced with a more powerful network card) and simply select 'disable' from the right-click context menu. This will prevent the drivers being loaded and treat the hardware as if it doesn't exist until such time as you re-enable it.

You can accomplish similar on a higher level by entering your BIOS and doing much the same thing. Look for a section called 'integrated peripherals' (or similar) and you'll be able to switch off individual components (on-board sound, graphics and network cards, for instance) that you're not actually using. This will stop even Windows from seeing that they're there, so zero resources will ever be devoted to them.

In the case of components that aren't on board (optical drives, for instance), disabling them is easy. Just open up your case and pull out the power supply. That way, it's there if you ever want to use it again, but out of the way until such time.

> **"When you're building a PC, there's no rule that says you have to clump the parts together"**

Just remember not to disable anything unless you're sure you know what it does. Disabling a crucial piece of hardware could prove disastrous for your system's ability to operate, and while it's usually easy to fix such mistakes, it's far from guaranteed!

10 Disable Acoustic Mode

Recognising that some people get annoyed by loud hard drive noise, some BIOSs have a setting called 'acoustic mode' which prevents your hard drive from making a lot of noise. Unfortunately, it does this by preventing your hard drive from spinning up to full speed, which slows down your access times and prevents applications from launching as fast as they could.

If you want to make sure acoustic mode isn't enabled, you'll have to look in your BIOS again. The exact location varies depending on your BIOS software; it'll either be in storage options or performance settings of some description. When you find it, you want to make sure the option is set to 'performance' or 'high-speed' or similar, rather than 'quiet'. That way you'll be able to enjoy the fastest access times your hardware can offer. And if the noise bothers you, just buy some ear plugs.

Note that this only works for mechanical drives. SSDs aren't affected by this setting, so changing it will make no difference! **mm**

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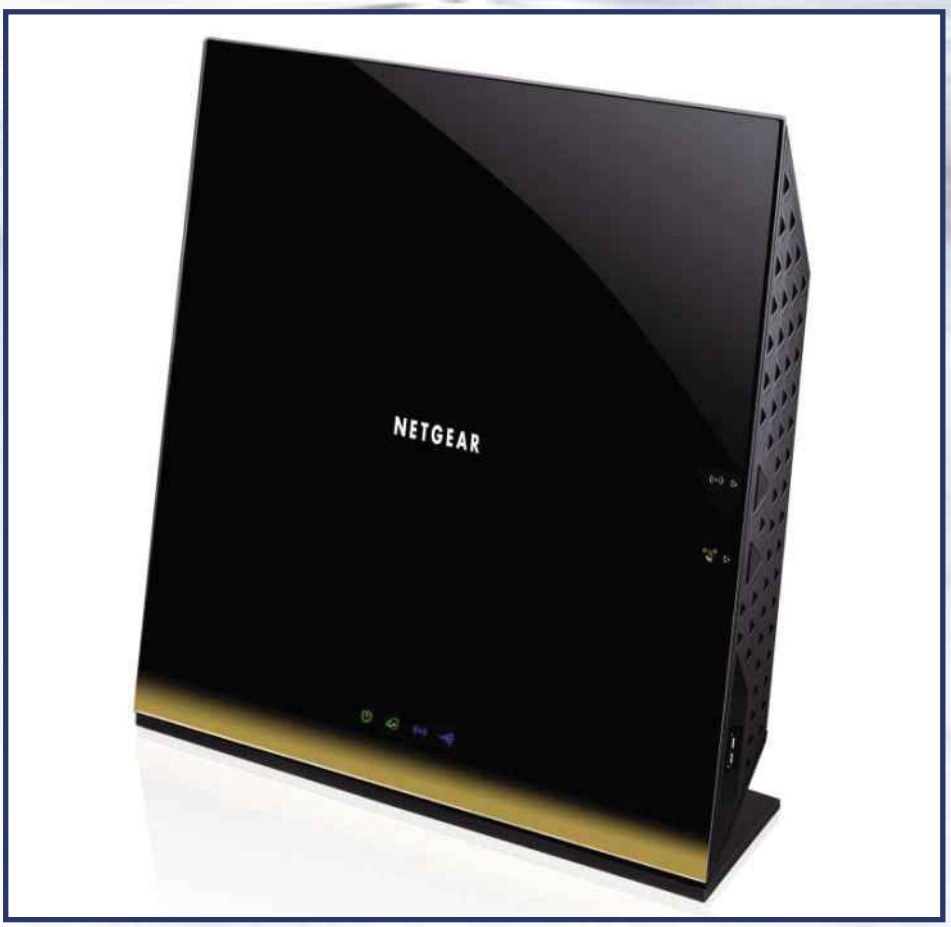
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5 Ways To Speed Up Your Network

Follow these essential tips for an easy boost!

If you run a network at home, it's probably straining under the weight of all the different devices and traffic it has to carry at once. From PCs to TVs to phones, a fast and reliable home network is more important than ever. If you're getting slow or intermittent performance that isn't originating on your ISP's end, maybe you can use this list of tips to help you fix it. And even if you're not, you can still use them to improve speeds and performance even further!



1 Upgrade Your Hardware To 802.11Ac

802.11ac doesn't have a much better range than 802.11n, but its bandwidth is significantly higher, so even a low-strength connection should be able to carry more data. 802.11ac is backwards compatible with older standards like 802.11n and 802.11g, so upgrading your router shouldn't cause any problems to your existing devices, but it will also mean you can take advantage of the faster speeds on offer if they support the newer standard, as the latest tablets, laptops, smartphones and consoles do.

If you do swap out your router for a Wireless AC one, remember that you also have to upgrade your Wireless N adaptors too, where possible. Network hardware with differing standards will run at the speed of the slower one, so if you have a Wireless N network card or USB adaptor, you'll need to also fork out for a Wireless AC one in addition to your router. The backwards compatibility means you don't necessarily have to do it at the same time if money's an issue, but you'll only see significant speed improvements if both ends of the connection are Wireless AC-enabled.

A new router will also give you access to many of the latest standards and features that your existing hardware might not offer (especially if you're using an old, low-cost variety provided by your ISP) – so in that sense it's doubly worth paying for!

2 Make Sure You're Using WPA2 Encryption

On any hardware, you'll have a selection of different security protocols to use. WEP is completely outdated and has been cracked so thoroughly that it effectively provides no protection at all, so make sure you're using a better standard than that at the very least.

However, if you're running WPA security on your 802.11n router, you're probably artificially hobbling your speed. The theoretical maximum speed for WPA encrypted connections is half as high as the limit on connections that use the

newer WPA2 standard. If you want to get full speed on a secure connection, make sure your network is using WPA2.

Changing the security could also mean that you banish anyone who might be leeching off your connection, whether because you had no security before or because they've managed to crack or otherwise procure the network key.

3 Rearrange The Antennas

If you have an unreliable, slow or weak network connection, the simplest correction you can perform is to redirect the antennas on your router and/or network adaptor. Network signals are surprisingly sensitive to interference from any number of sources – microwave ovens and other electrical equipment are obvious ones, but sometimes a reflective or flat surface is enough to cause serious havoc with your connection.

Redirecting the aerials on your equipment gives you a chance of establishing a strong, more reliable signal by reorienting the hardware in such a way that it's more likely to pick up the radio waves. There's no real art to figuring out what works best; just point them in different directions and see whether the signal gets stronger or weaker.

If you really want to boost a weak connection, it might make sense to move the router completely. As long as your cables are long enough, there's no reason to leave the router exactly where it was installed. The closer it is to your network adaptors, the better, so ideally it should go somewhere near the centre of your house where its coverage will encompass the most useful range. If you can get it into the same room as your most frequently used devices, even better – walls are a major culprit in weakening wi-fi radio signals.

4 Start Shaping Traffic

If you're running a network where there are lots of heavy users (if you have two teenage kids, if you're living in a shared house, that sort of thing), then you undoubtedly know how network performance can be seriously impacted if two people try to do anything at the same time. Lost packets, dropped connections and spontaneous router reboots are all possible if the hardware gets too taxed. So maybe you can find a way to stop it by using traffic shaping.

Traffic shaping means that you turn down the priority on certain forms of network traffic (such as streaming video) so other forms (such as web browsing) can be given greater attention. Video streaming uses huge amounts of data, so letting through one web page request first is unlikely to make a dent, whereas if the two have the same priority you could end up waiting ages just to read one article. Alternatively, if the connection is poor, you might want to prioritise things like video and voice chat to prevent stuttering and interruptions while file downloads and web traffic take a back seat.

Most routers store their traffic-shaping capabilities under a category called 'Quality of Service', which may be abbreviated to QoS. Depending on the level of sophistication your router has, you might need to know things like the IP address of the computer you want to traffic-shape and the virtual port that it uses (i.e. port 80 for http traffic). Other routers might come with a selection of predefined QoS settings available for you to choose. There's no one system for it.

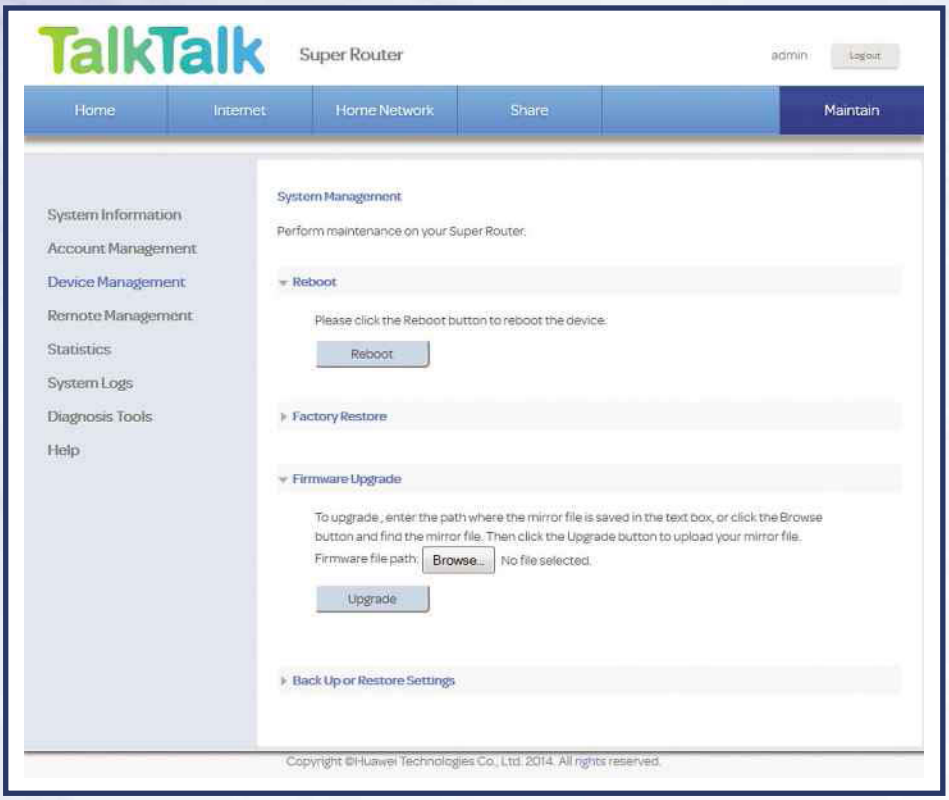
In some cases you can also add the MAC address of your computer, smartphone or other network adapter to ensure your system gets additional priority over the rest of the network. It's not foolproof, but with a bit of tweaking you can normally improve performance on busy connections without too much effort required. Note that QoS settings don't change or limit the amount of data that's actually sent; it simply tells your router which data to deal with first.

5 Update Your Firmware

Installing new firmware in a router can be an irritating process, not least because it might wipe out custom settings you've built up over years of use, but new firmware can add features, iron out bugs and improve compatibility, all of which can contribute to a more robust network signal. In some ways, upgrading the firmware makes old routers feel like new.

Firmware downloads are normally available from the manufacturer's website, and updating the router is a fairly simple process, which can be accomplished from the system's administration backend.

If you're feeling particularly adventurous, you could try replacing your router's firmware with a free, open-source alternative called DD-WRT. Available from **www.dd-wrt.com**, the firmware adds a number of features and greater controls not found in most router software. It's not for novice users (improper use could turn your router into little more than a decorative brick), but if you think you have an old router around that might benefit from the more advanced software, it could prove a fun experiment! **mm**



▲ *Doing a firmware upgrade can make all the difference*

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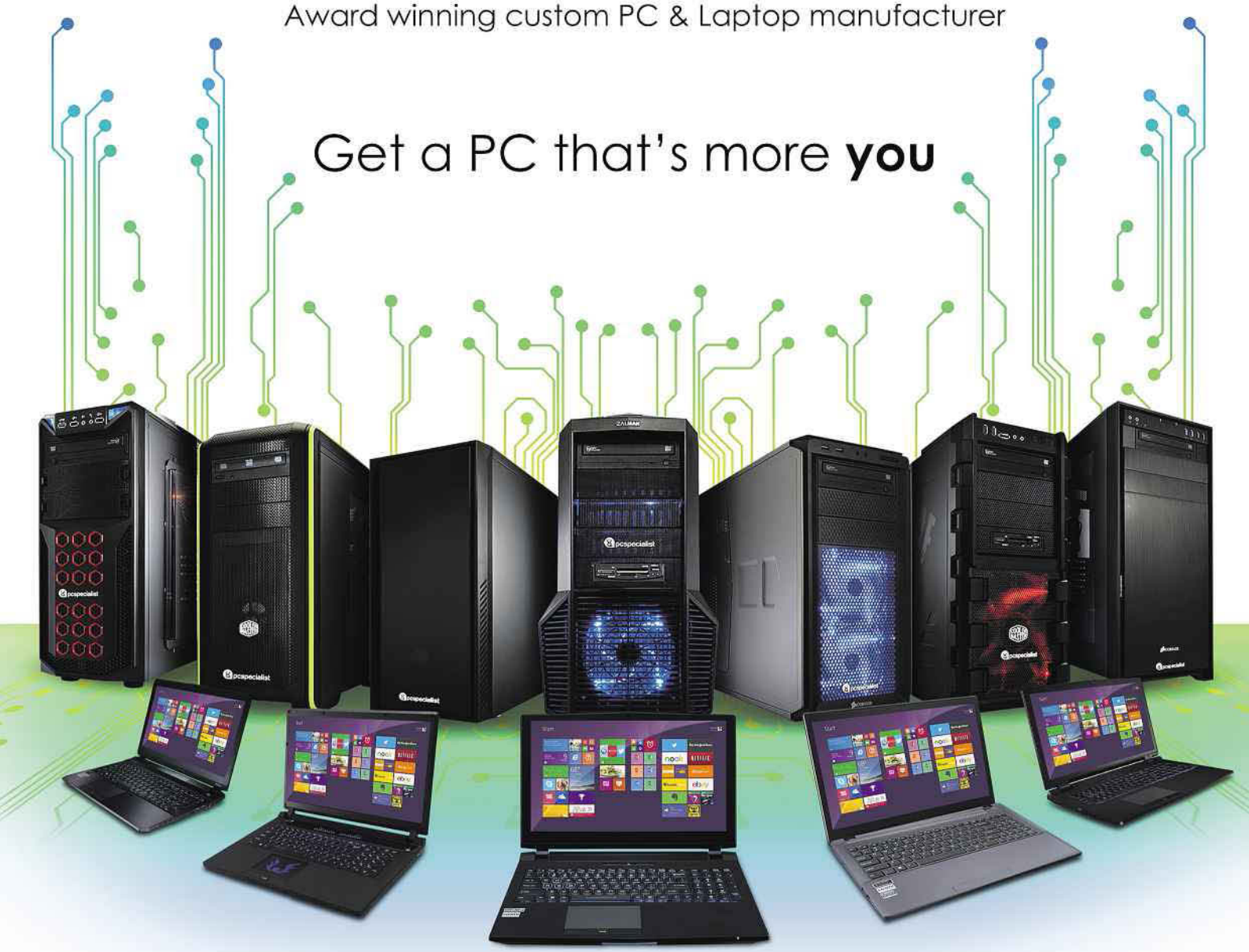
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Essential Performance Benchmarking Software





BootRacer 4.9

www.greatis.com/bootracer

An unexplained slowdown in Windows' boot speed is one of the most difficult problems to explain and repair, not least because the causes of it can be varied and unintuitive. If you want to track the effects that various settings, configurations and software installations might have on your system's boot time, you need a program like BootRacer.

Rather than try to make you figure out what's slowing your system after it's happened, BootRacer provides a constant monitor of boot times so you can see how and when something has affected it as soon as that happens. It's compatible with multiple versions of Windows, from Windows 2000 and XP right up to the forthcoming Windows 10, and it can be downloaded direct from the website or through the Windows store. In all cases, it's free for non-commercial use, and the requirements are miniscule: it needs less than 10MB of disk space to install it.

Once installed, BootRacer tracks your boot time and displays it after each launch. Its own impact on a system is negligible, and while it doesn't have a huge range of features, it does focus well on its main task – boot time calculations automatically exclude any password timeouts, ensuring accurate and useful reportage of the Total Boot Time, and the details are logged to both its own 'History Report' and the standard Windows Event Log, so you can check them however you prefer.

It's undeniably basic, mainly because it's designed to be an analysis tool, and won't help you speed up your boot times. It's purely for checking them, but in that respect, it's brilliant.

PassMark PerformavnceTest 8.0

www.passmark.com/products/pt.htm

PassMark PerformanceTest is a whole suite of tools designed to thoroughly benchmark every major aspect of a PC's performance. It's fast, easy to use and configure and boasts a huge range of tests that give clear, objective results, which can be easily compared with other users.

We're not exaggerating when we say it tests almost everything. There are five benchmarking profiles, which run 32 separate tests between them, as well as seven 'advanced testing' windows, which let users run custom benchmarks. As well as 2D graphics, 3D graphics and CPU operations, it also evaluates the performance of disks and memory, and even more obscure things like CD/DVD performance, network speeds and even the physics performance of your graphics card.

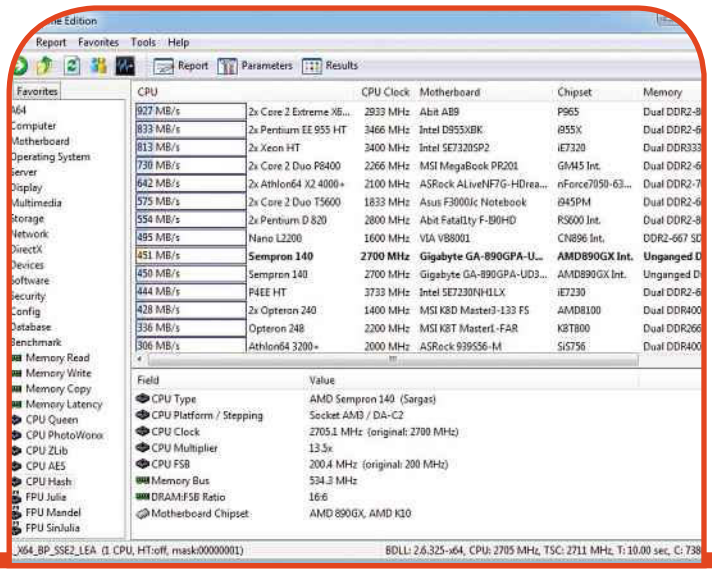
Results can be aggregated into a single PassMark Rating result you can compare with similar systems, while a built-in 'baseline' result allows you to see how your system performs against a fictional average build. You can also save your latest results as the new baseline in case you want to try out some tweaks or check the performance increase caused by an upgrade.

With so much going on, it's probably not much of a surprise to learn that the software isn't free, but it is incredibly reasonable. There's a 30-day evaluation period, and beyond that point the cost of $27 isn't going to break the bank. If you only want to use one piece of software from this list, this is the one you should go for.

Make sure your computer is working as well as it can

Improving your productivity isn't always about upgrading your system. Sometimes it's about finding out how you can use the hardware you have more effectively. Speeding up your PC means identifying and eliminating bottlenecks wherever you find them, and to do that you need the right pieces of software to help you find out where it is that your system is slowing down.

Finding the right programs for you can be difficult, however. That's why we've put together this list of essential benchmarking tools that can help you in your quest to tweak and improve your system until it's running as smoothly as if it were new.





AIDA64 Extreme Edition

www.aida64.com/products/aida64-extreme

We're not clear on what makes this version of AIDA64 'Extreme' (the only alternative is a more expensive commercial version) but that aside, it's hard to criticise this all-purpose benchmarking software on almost any level.

Designed as a streamlined Windows diagnostic and benchmarking tool, AIDA64 Extreme Edition can assist with overclocking, hardware error diagnosis, stress testing and sensor monitoring. It simultaneously keeps track of the condition of your CPU, memory and disk drives and is compatible with all versions of Windows.

The analysis tools are sufficiently thorough, with a number of CPU processing benchmarks, tests on RAM bandwidth and latency, and the transfer speeds of any attached disk, whether it's a mechanical drive, a solid-state drive (internal or USB-based) or an optical drive. Stress tests for each type of hardware give your components a proper going over, and there's even one for the GPU as well. If you have the necessary sensors in your system, AIDA64 will monitor temperature, voltages, power drain and fan speeds, and this information can be displayed in a number of areas, from the system tray to a makeshift OSD.

The software sets itself up well as a one-stop shop for benchmarking, and its clear interface and wide range of tools give you everything you need to get started with benchmarking. Ideal for beginners, even if the price – $40 – is arguably a little high for newbies.

Unigine Heaven 4.0

unigine.com/products/heaven

If you want a 3D benchmarking suite that'll test your graphics card to the limit but won't demand similar from your wallet, Unigine Heaven 4.0 is the one to go for. Designed as a stress-tester first and foremost, for testing the stability of a GPU, it's an excellent choice for overclockers who might want to check that they've taken adequate cooling performance and need to guarantee stability when playing games. If your hardware can survive Heaven's benchmarks, it can survive anything!

The tests are non-synthetic, and similar to 3DMark in that they involve interactive navigation of a genuine, fully rendered 3D world designed for the purpose of testing cards to their fullest extent. The benchmarking takes place entirely in the GPU, so there's no chance of the processor or memory influencing the results, and tests can be tweaked to place the emphasis on individual graphical features. It also supports multi-monitor setups and stereographic 3D. There's also a software-only rendering mode that can be used as a reference.

It's definitely one for enthusiasts, but beginners may still get something from it as long as they have a glossary on hand to look up the terms they don't understand. As graphics benchmarking software goes, it suffers from placing such a heavy focus on gaming when there are other things people might use a graphics card for, but it's definitely the best example of a graphics testing suite around. We'd recommend it even if it wasn't free. The fact that it is, for the most part, just makes it all the more attractive over its rivals.

Retailer Profile

Computer Orbit

We speak to one of the UK's top computer retailers

The 1990s were a fun time to be in computing. The computer fair was on the rise, and this gave an opportunity for lots of small businesses to break into making and selling PCs. One such firm was Computer Orbit, but unlike many of its contemporaries at the time, it's built and built since those early days – so much so that it's a thriving business in 2015. It's gone from a small system builder to something far bigger, without losing sight of its core beliefs.

After all, even from those early days, Computer Orbit prided itself on the strength of its buying power, which allowed it to bring its prices down. The firm soon became one of the biggest independent computer stores in the north east of England. It eventually pulled out of computer fairs in 2002, instead choosing to open its trade shop up and deal with customers there.

"I was 16 when we started, and always found it really interesting. And so my dad got me involved," Computer Orbit's Kasim told us, and he started looking after the business pretty much full time from the age of 18. "We used to get a lot of people coming in knowing what they wanted," he told us, describing how things had changed across the time Computer Orbit has been in business. "But then there's been a bit of shift." Hence, the firm invested in staff who could give customers an excellent service, whether people came into the shop knowing exactly what they wanted or nothing at all.

"Our store used to be a trade counter. In 2002 we stripped the whole warehouse down and turned it into a really big store," Kasim told us. And Computer Orbit hasn't really looked back since. A bigger store attracted more and more customers, and a shop is at the centrepiece of the business to this day.

That said, Computer Orbit's reach is far, far wider. Courtesy of the online side of its business, it attracts customers from the UK and far beyond, but customer service remains paramount. Stock availability is important, and the firm keeps its warehouse in the north east of England. A brand new website has enlarged the range of products that Computer Orbit offers, and online expansion has been one of the key investments this year.

"We're known for our service and after-sales," Kasim says. "The website will let people know what's in stock at our branch or at our warehouse. We want to be nice and clear, while still competing online."

The new website has been worked on for "eight, nine months" and has recently gone live.

One more thing to ice this particular cake: on its higher-end systems now, it's extended its already generous warranty package to three years. "We do want to give that extra piece of mind to the customer," said Kasim. "And we've got such good relationships with our suppliers that we can offer a longer warranty on key components. The main thing is that when you're spending £1,500 or £2,000 on a machine, that extra year warranty is going to give extra piece of mind."

Computer Orbit's new website can be found at **www.computerorbit.com**.

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Windows Tweaks To Speed Up Your PC

Windows has some interesting options that can improve system performance

Just because Windows LOOKS like it isn't doing anything, it doesn't mean that it isn't. There's almost always something going on under the surface of your operating system, and sometimes it's using up more time and resources than you realise. This contributes to a PC that runs slower and less efficiently than you want it to.

If you're starting to feel as though Windows is sluggish and unresponsive, don't worry. There may be a way back. Here, we've got a selection of tips and tricks that should help you remove all the busywork and embellishments that Windows puts in the way of the things you actually want to do, so that Windows is ready to go as soon as you need it.

Most of these tips are written with Windows 7 and 8 in mind, but most of them should work (in principal) for Windows XP, Vista and 10 as well – though be aware the exact wording (and menu path) to certain options might change depending on the version of the OS you are working with.

1 Disable Thumbnails

If you have a directory full of pictures or videos, trying to browse the folder can become a little bit like trying to swim through a pool of tar. Whenever you browse it, Windows tries to load new thumbnails from scratch which results in a slow, churning disk drive and a long wait as it tries to do something that probably takes several times longer than whatever task you were planning on.

Disabling the thumbnail preview feature entirely will stop Windows from creating previews of these files when you enter the directory, leaving you to browse them at your own pace. To do this, open Windows Explorer, click Organize > Folder and Search Options > View, and tick the box that reads "Always show icons, never thumbnails". It's mainly useful for mechanical drives rather than SSDs (which should be quick enough to load thumbnails near-seamlessly) but if you browse a lot of media and don't need thumbnails, it'll save you hours in the long-term!

2 Disable Defender

Windows does come with its own anti-malware program installed, but the reality is that it's pretty light on features and the kind of protection that most people would consider essential. It's better than having no dedicated antivirus, but it's not as good as having almost any commercial version either.

Assuming you've already got a good virus scanner installed, there's absolutely no reason to leave Windows Defender enabled. It'll routinely download updates, slowing down your Internet connection and using up processor and memory resources that might be better spent on an actually useful antivirus program.

To disable Windows Defender, run the software's front end then click Tools > Options > Administrator Options, then uncheck the 'Use Windows Defender' option. You may find that Windows thinks you have created a security risk by doing this, but you can turn those warnings off if you're confident in your antivirus – indeed, most will be recognised by Windows automatically.

3 Cull Boot Programs

We've all faced the irritation of a PC that goes all sluggish after it's just been switched on, preventing



you from getting to work as it grinds away at some unexplained task. The problem is usually that Windows tries to load a huge amount of background services as soon as you log in, many of which you don't ever need – let alone every time you run it.

To disable some of these, click Start > Search, type 'msconfig' then press enter to open the System Configuration tool. Have a poke around the 'Startup' tab to see what you can remove to keep your startup streamlined.

It's worth noting that the MS Config tool is only supposed to help you make temporary changes to your startup. If you find that your system isn't negatively impacted once you've disabled the options here, you should find a way to remove them from your startup permanently rather than leaving them unticked in MS Config.

4 No Flashy Interface Effects

You'd be surprised how much effort your system can expend on a flashy interface, especially if you don't have a separate GPU capable of doing the heavy lifting. As much as we all love the transparency effects of the Windows 7's Aero interface, it's hard to deny that the resources spent on these frivolities might be better spent on running your software.

To disable the effects and recover valuable CPU cycles, right click on your desktop and select 'Personalize'. Scroll down the 'themes' box and choose 'Windows 7 Basic' or 'Windows Classic'. The new theme, without the effects, will now be enabled. Your system resources are then free to concentrate on more pressing matters.

In both Windows 7 and Windows 8, you also have the option to disable other animations and eye candy which suck up resources destined for more essential tasks. Not always a huge amount, admittedly, but enough to make a difference on low-end systems. To disable them on an individual or collective basis, press Windows + R, type "SystemPropertiesAdvanced", click "Settings" under the performance heading and select "adjust for best performance". If there are some effects you can't live without, you can also turn them on and off individually using the 'custom' settings below.

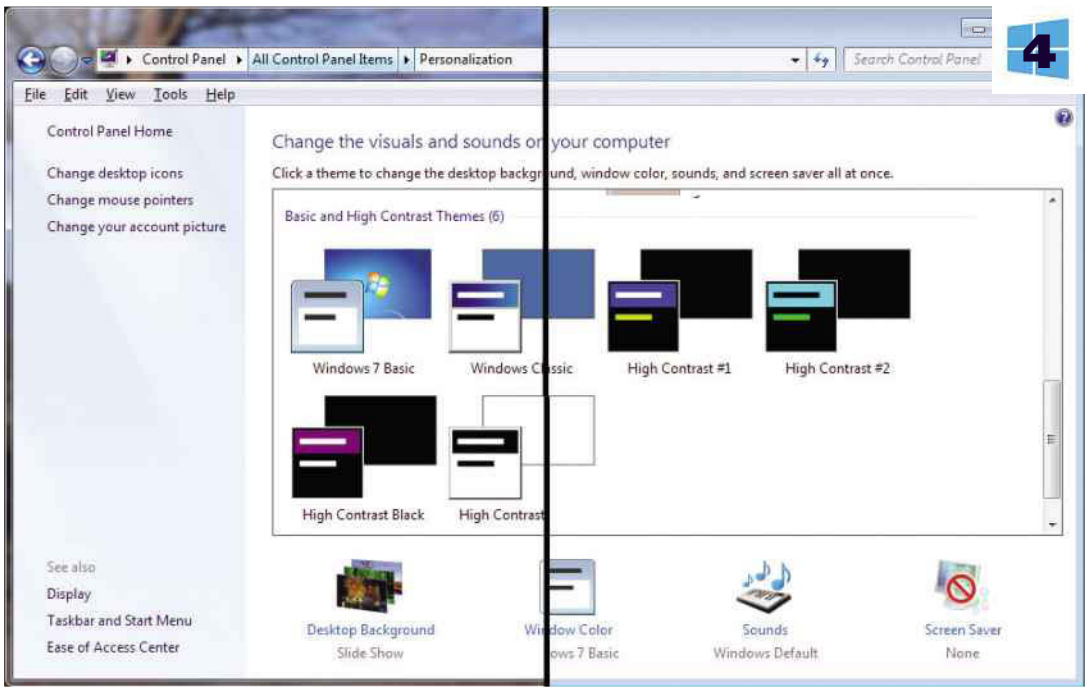
5 Disable Unused Elements

There are plenty of parts of Windows that, for whatever reason, you may never use and which simply hang around your installation taking up space and being loaded every time you boot to zero positive effect. These disused services and applets can be easily discarded in favour of recovering the hard drive space, RAM capacity and CPU time they occupy.

To find and disable anything you don't use or need, click Start, then 'Control Panel', then 'Programs and Features'. In the pane on the left, click 'Turn Windows features on or off'. You can now go down the list and uncheck features you don't use, freeing up resources and generally decluttering your installation.

6 Turn off Search Indexing

The Windows Search Indexer can spend ages reading file contents and storing them so that your searches run that little bit faster. However, if you don't run searches very often, or even use another program, the Indexer is just wasting time churning up your hard drive for no good reason. Disable it by clicking Start and typing 'services.msc' into the search box. Press enter to bring up the Services dialog, then in the



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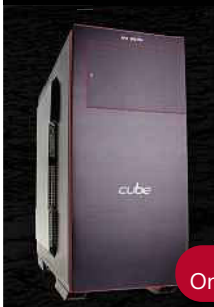
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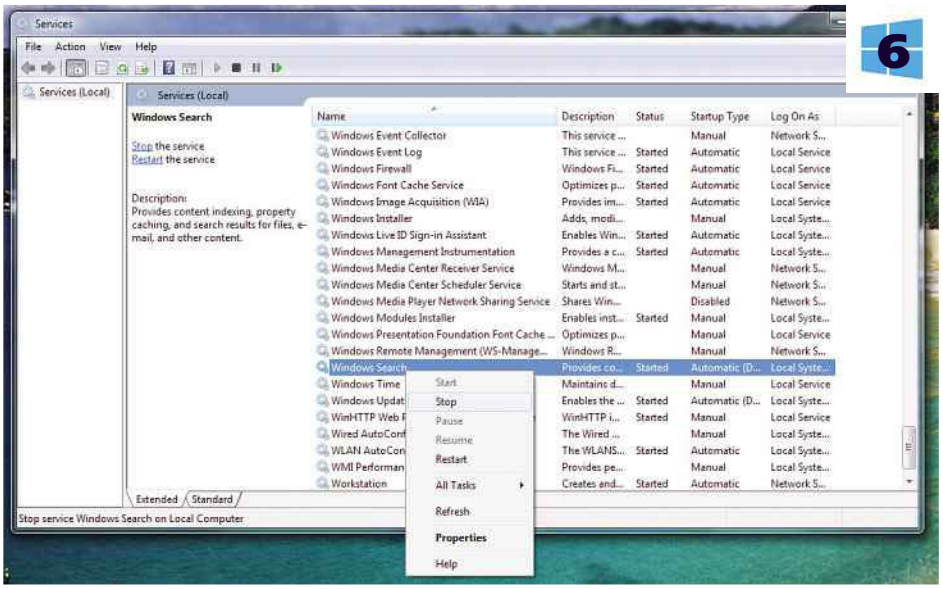
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list of services, find 'Windows Search'. Right click on it and open the 'Properties' dialog. Choose 'Disabled' in the 'Startup type' dropdown, then click OK.

Next time you reboot, the indexing service will be disabled, giving you back the resources it would otherwise be taking up. Note that you may get a warning that it is disabled whenever you perform a search in the future. To remove this warning, open Windows Explorer, click Tools > Folder Options > Search, then check 'Always Search File name and contents', and also 'Don't use the index when searching'.

Remember, disabling the indexer will have the consequence of slowing down any searches you perform – particularly if you're searching for the contents of files – but if you only do the very occasional file search it's probably better to let the delay happen once when you want to perform the search, rather than constantly when you don't want to.



7 Remove Unwanted Fonts

When certain applications (such as Word, or Photoshop) launch, they can spend a significant amount of time reading in all of the different fonts on your system. Removing any fonts that you don't think you'll use fonts could help to speed up the launch times and also free up some resources while those programs are in use. To uninstall any that you no longer want or need, click Control Panel > Appearance and Personalization > Fonts, then select any fonts you want to get rid of and simply hit 'Delete'.

8 Unplug USB Devices

It may not be obvious, but when you have USB devices plugged in (and switched on, if they don't get their power from the USB socket) then Windows will notice. When does, it'll helpfully load the drivers for them, assuming you won't mind the slowdown that occurs in your start-up process while it does.

If you've got a microphone, game controller or some other USB-connected peripheral that only gets picked up once every ten times you boot your PC, unplugging it will prevent Windows from taking the time required to load the necessary drivers, shortening the time it takes from you logging on, to you being able to actually use your PC in any meaningful way.

It's a simple but surprisingly effective trick that can make a small but positive difference to your system.

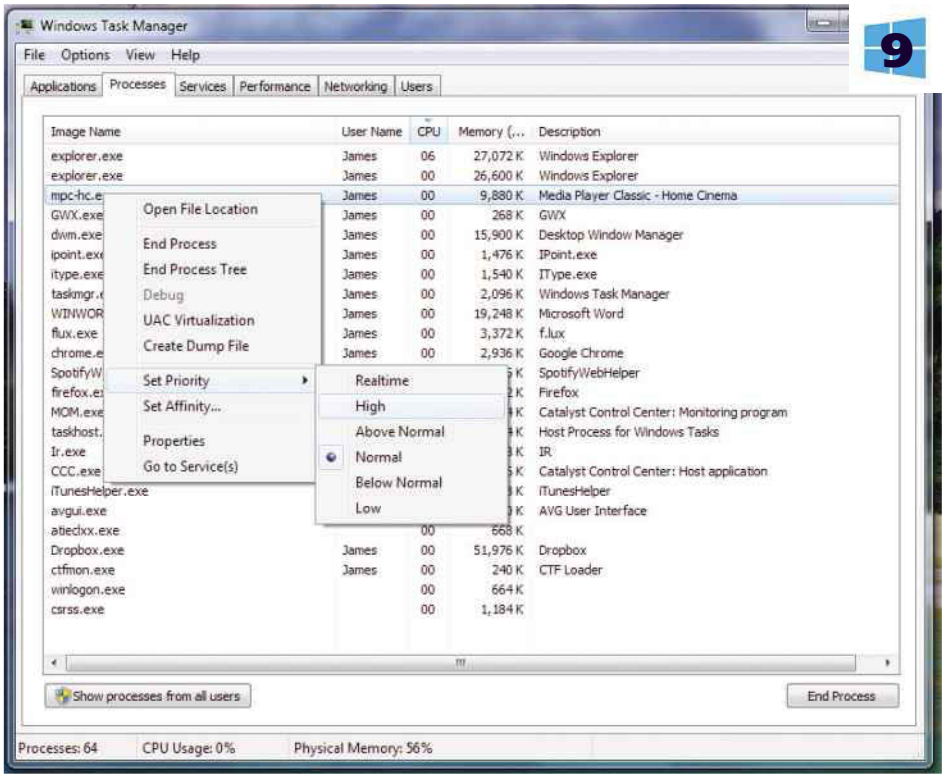
9 Micromanage Your Apps

If there's one program that seems to be suffering because of another – maybe video playback that's stuttering, or games that keep slowing down because your antivirus wants to pile on some more resources for a background scan, there is a way you can tell Windows to prioritise one program over another.

All you have to do to sort this out is open Task Manager (CTRL + SHIFT + ESC), open the Processes tab, then locate the program you want to prioritise. Right-click the name of it and in the context menu choose 'Set Priority' and choose the value you want.

You can deprioritise as well as prioritise applications, but generally you only have to set the one you want to a high level – they're relative values rather than absolute ones, so setting one program to high priority will have the same effect as if you set all of the others to low priority.

It's important not to interfere with processes you haven't launched yourself, though. Changing their priority could cause your system to lock up or crash. Avoid setting processes to 'real time'



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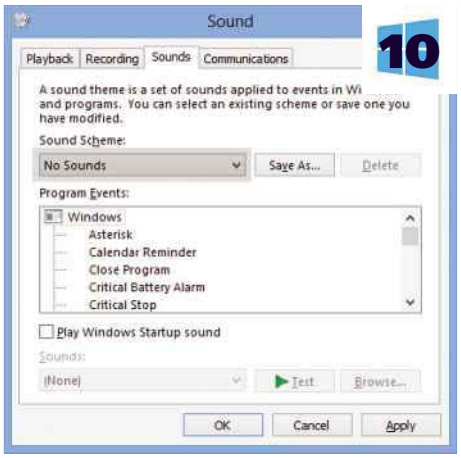
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priority as well. This will devote your system's maximum possible resources to the task, which is fine as long as it's not stuck in a loop or becomes non-terminating. Again, click the wrong thing and you may end up with a locked system that needs a reboot to get working again.

10 Disable Sound Notifications

The dings and chimes of Windows and its many alerts can quickly become familiar, but in what we can only imagine to be a bizarre holdover from the days of Windows 95, turning on sound alerts can actually cause Windows to delay refreshing itself in various ways. It may only mean a brief pause while it caches a wav file, but it's noticeable in a small way – again, particularly on low-end hardware.

Disabling sound notifications on alerts has virtually no effect on Windows operation, assuming you have no visual impairments that rely on them, but it does contribute a tiny speed increase. To get rid of them, open the 'Sound' section of control panel, find the sounds tab and set the scheme to 'no sounds'. This will get rid of all audio related to dialog boxes and pop-ups, and recover those precious lost milliseconds (which, in an OS as notification-prone as Windows, can really stack up).



> **If there are certain programs you use daily – stuff like your browser, notepad, and Windows Explorer – then it pays to keep them only a click away**

11 Organise Your Apps

If there are certain programs you use daily – stuff like your browser, notepad or maybe Windows Explorer – then it pays to keep them only a click away. The Windows start screen and start menu might be relatively quick, but the programs they feature are all a couple of actions away at best, whether that's keypresses or clicks. By contrast, if you pin your most-used apps to the taskbar, you can launch them in a single click or the push of a single shortcut combination. A genuine time-saver if it's something you need many times in a day.

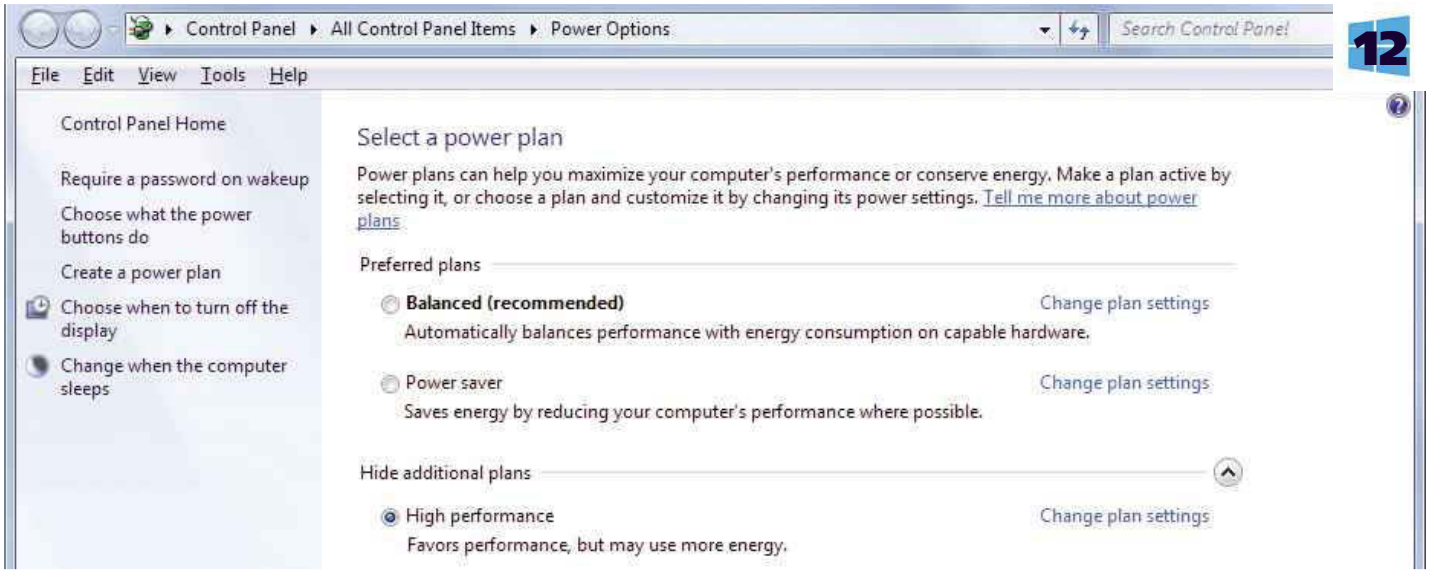
The easiest way to pin an application to your taskbar is to wait until it's running, right-click on the taskbar icon, then select the 'pin this icon to the taskbar' option – though you can also drag and drop it from the desktop or an explorer window or right-click a shortcut and select 'pin to taskbar' – in fact, there are so many ways to do it that there's no excuse not to set it up for your favourite programs.

12 High Performance Mode

The default performance plan for Windows is 'Balanced' – meaning that Windows will attempt to ensure that your PC runs as well as possible, but only up to a point. Essentially, it makes sure it won't start sucking up your battery charge or running up a huge electricity bill in order to run everything at full tilt.

If you're not so bothered about either of those things, you can visit 'Power Options' in Control Panel and select 'High Performance' to keep your hardware running at its best regardless of how much power that will suck up in the process. On the other hand, you could also use the same menu to switch to the power saver mode if you want to make sure your laptop battery gets stretched as far as possible.

Theoretically, Windows should switch between these three states automatically depending on the current need, but forcing it to one mode permanently will reduce any clunkiness as it makes the change. We might only be talking about a second or two delay in launching a CPU-intensive task here and there, but as with all of these things the time taken soon stacks up – and if your goal is to get your system running as quickly as possible then you need to stack up everything you can. Good luck getting your installation in shape. **mm**





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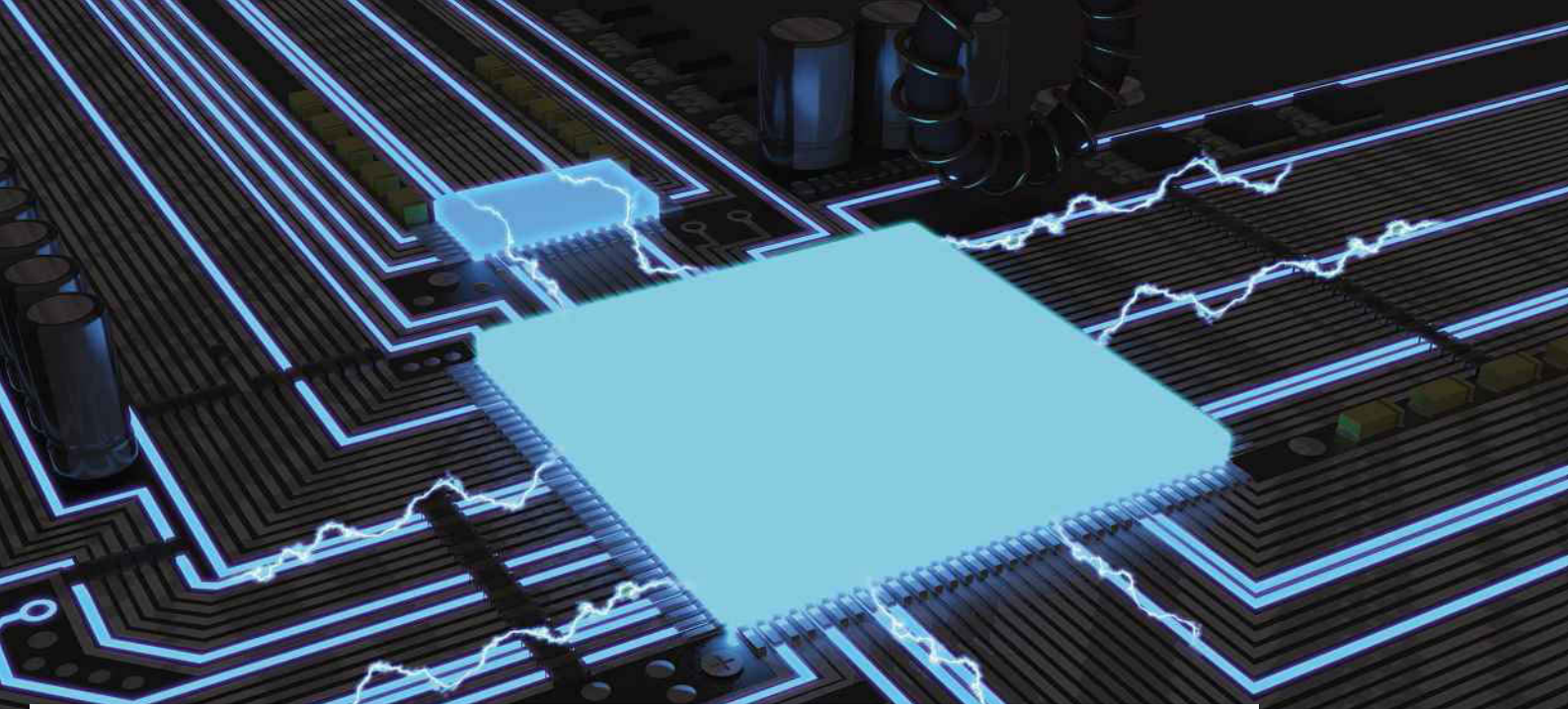




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10 Ways To Boost Your Gaming PC

While new hardware is sometimes the only option, it's not always the case...

Is your gaming system struggling to run as well as you want it to? Is it faltering when it comes to play the latest games, and generally failing to capture the magic it had when you first built it? Well, you're not alone in that. Every gaming system goes through this phase, it would seem.

You could simply replace the whole system from the ground up, but that's expensive and – to be honest – more than a little bit lazy. So, before you get your wallet out and hit high street for new components, you might want to try these 10 tips for boosting a gaming system first and see how they work.

1 Install New Graphics Card Drivers

The graphics card is the most essential component in any gaming system, so it really pays to keep it in good shape. That means making sure you have the right drivers installed so games can take full advantage of its capabilities. Older and out of date drivers – even if they're only a couple of weeks old – can mean the latest titles aren't getting the power they deserve.

We're not talking a trivial amount here either. A simple graphics card driver update has been known to improve performance by up to 70%. It's usually a lot less than that, admittedly, but it almost never goes the other way – and even if it does, rolling back drivers is easy. There's virtually no reason not to have the latest ones installed.



The drivers themselves are easy to get hold of. Nvidia and AMD both post the latest on their websites (you can even install beta versions if you can't wait for the fully tested versions – and betas are the best way to get the fastest framerates on the newest titles) while Intel's drivers for onboard graphics chips are easy to get hold of using Windows Update.

2 Clear Out Your Hard Drive

Games are often quite data-heavy, and that means two things: they need a fast hard drive access and they need the space to properly swap data in and out of virtual memory. If you drive is near-full and fragmented, you'll see the performance drop represented quite directly in your framerates.

The first thing to do is make sure your drive has plenty of free space available. If at all possible, make sure it has at least 20% of its space unused (but the more, the better). Then run a full defrag on it. Defragging a drive will order the contents so free space is kept together, making it faster to read and write from, which means games won't be as badly held up by drive access times.

If you have an SSD the bottleneck will be much lower, but you can still optimise the disk by using the TRIM command. This wipes any unused sectors, making them slightly quicker to access – but in fairness, you're not going to see anywhere near as much of an increase (if you see one at all) as if you defragment a mechanical drive. Take heart, though – SSDs are already significantly faster than mechanical drives, so you're still way ahead.

> **If you have a lot of programs running the background, your game isn't going to be getting all the resources it needs**

3 Kill Background Processes And Software

If you pay attention to such things, it's very quickly clear, that games use up a lot of system resources to run. They generally need as much RAM, drive space and CPU time as your system can possibly devote to them to ensure their smooth running, so if you have a lot of programs running the background, your game isn't going to be getting all the resources it needs. The solution is simple: stop them running before you play. Or indeed, forever!

As an operating system, Windows is particularly bad for allowing programs to run stuff in the background without letting you know. The program is that every program you install seems to think it needs a helper app running at all times, and that it's justified in doing so because it's only using a small amount of your system's full capabilities. It doesn't take long before they stack up and those small chunks of resources suddenly becomes a large system drain.

To see your background services, you can press Ctrl-Alt-Del and look at the process manager (you may need to google the names of some to see if they're needed) to see what's running so you can uninstall any you don't want, and you can also look at your list of background services in the control panel and turn off any which you know you don't need. It isn't likely to give you a huge boost – but every frame counts!

4 Overclock Your Graphics Card

Overclocking a graphics card GPU can be intimidating in a way that CPU overclocks rarely are these days, especially if you're worried about having to apply extra cooling. As we've already established, though, gaming performance is tied to your graphics card performance – so if you can squeeze any more out of it it's worth doing.

With that in mind, a small overclock might be worth doing if you have a card with a fairly good cooler. Many cards are sold slightly overclocked as it is, but if yours isn't one of them you can almost certainly get a few more MHz out of it. Most graphics drivers allow overclocking in software, so increment the card's speeds in 5% jumps and perform stress-testing benchmarks after each turn. As soon as the stability falters, revert to the previous setting and you should be good to go.



Remember that overclocking can damage your hardware so it's done at your own risk, and will almost certainly shorten the lifespan of your card – though if you think how often you've had to replace a graphics card because it failed completely, that may not be as huge a disincentive as it sounds.

5 Upgrade Your Processors

How old is your current graphics card or CPU? If the answer is more than a couple of years, then chances are that even the mid-price hardware on the market is capable of running yours into the ground. This, we're afraid, means it's time for an upgrade.

Hardware upgrades can be an expensive way to get a performance hike, so unless you have a huge amount of money spare it's rarely worth upgrading just to play a specific game. Rather, once you see a pattern of choppy framerates and discover yourself switching detail levels to minimum more often than not, then you should make the leap.

You should be looking for around a 25-50% improvement when upgrading if you want your hardware to tide you over for another couple of years. We'd recommend starting with a GPU first, partly because it's usually the thing holding games back, but also because upgrading your CPU can often mean a new motherboard and possibly even RAM – and that's when the costs start to stack up. A high-end graphics card with a mid-level CPU will run games far better than a high-end CPU with a mid-level graphics card, so concentrate on that first. It's the best way to see effects quickly.



“The good thing about SSDs is that you don’t have to replace your standard hard drive to use one”

6 Install An SSD

As we said before, hard drive speed is tied to game performance and slow drives can mean games that stutter and struggle to run. If cleaning up your existing drive isn’t practical, you could spend some money on an SSD instead.

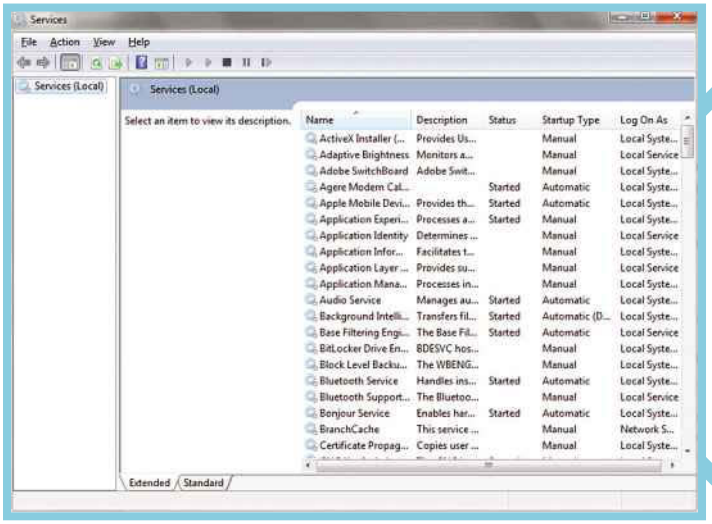
SSDs are super-fast and effectively remove any storage-based bottlenecks that you might experience while gaming. They’re also cheaper than a CPU or graphics card upgrade. While the performance hike isn’t likely to be as big as a new GPU might offer, you should see a notable improvement – especially if the hardware bottleneck is coming from your hard drive.

The good thing about SSDs is that you don’t have to replace your standard hard drive to use one – you can simply run the two in tandem. This gives you access to the increased speeds of the SSD’s storage while retaining the capacity a mechanical drive gives you, which considerably mitigates the low storage capabilities of solid state hardware that might otherwise put you off. Given that you can pick up 240GB of SSD for less than £100, it’s probably the best value upgrade you can make in terms of gaming performance.

The only down side? If you’ve already got an SSD, the improvements you can make by adding one or upgrading are negligible. Otherwise, it’s probably the best place to start.

7 Disable Superfetch & Prefetch

If you’re already running an SSD, you should probably turn off these two Windows features as well. Superfetch and Prefetch are services designed to reduce application loading times, but they’re only intended for use with mechanical hard drives. If you’re running an SSD, they’re actually just getting in the way of smooth operation.



The most recent SSDs see less of a negative effect from this type of problem, but if you’re running and older one then you could see major improvements in how fast your games (and other applications) launch by disabling them.

To switch them off, go into the services area of your control panel and find the entry for ‘Superfetch’. Set it to disabled (or manual) so it stops running automatically. Disabling Prefetch is a little trickier – open regedit and navigate to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management\PrefetchParameters. Double click on ‘EnablePrefetcher’ in the right-hand panel and then change the ‘Value Data’ to ‘0’ (the default setting is ‘3’). Make sure not to change anything else – editing the registry is a tricky business and has the potential to cause major configuration problems with Windows if done incorrectly!

8 Tweak your Graphics Card’s settings

Whether you want to overclock your GPU or not, there are still plenty of settings in your graphics card’s control panel that you might want to switch on or off if you’re starting to find that games lag when you’d rather they didn’t. For Nvidia cards, it’s worth looking at the following areas of your 3D settings:

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Maximum Pre-Rendered Frames: A high value here results in smoother framerates, but can also be the cause on input lag. If your games seem sluggish, that could be the reason. Drop it down to '1' and your card will always be processing the latest frame, improving responsiveness.

Threaded Optimization: This option should always be set to 'ON' (though it isn't). It allows your GPU to take full advantage of multi-core CPUs rather than restricting operation to a single CPU core.

On AMD/ATI cards, look for these options in the section marked 3D application settings:

Smoothvision HD Anisotropic Filtering: Anisotropic filtering uses smart algorithms to stop textures in the distance from being distorted, but it can massively increase the load on your GPU. Disabling it might slightly affect visual quality, but unless you've playing at super-HD resolutions you probably won't even notice.

Mipmap Detail Level: Again, this is related to texture quality. High detail levels use full HD textures, whereas low ones allow the textures to be compressed, resulting in a slightly blurrier look. Again, most of the time you won't notice any change while you're actually playing, so feel free to drop it down and take the resulting framerate hike.

9 Disable Vsync

On all graphics cards, whether AMD or Nividia, you'll find a setting known as 'Vsync'. This refers to 'Vertical Sync' and means making sure that your graphics card sends an update synchronously with your monitor's refresh rate.

Disabling Vsync can lead to a visual phenomenon known as 'tearing', where the problem is essentially that your screen has updated while only half of the image was drawn in the graphics card. But it also means that games have a slightly faster framerate, because they're always churning through the next frame and never idling while they wait for the monitor to update.

> **"Dust makes components inefficient, and worse – it can make them noisy as well"**

Note that this only has an effect if your in-game framerate is lower than your monitor refresh rate. Most monitors update at 60Hz, so if your game is running at 80fps (which is admittedly quite high) you probably won't see any difference. The majority of users will see some speed improvement, though, so it's definitely worth considering. At the very least, if the graphical issues are a problem they're easy to remove – simply turn Vsync back on!

10 Physically Clean Your PC

Remember that system performance can be directly connected to how hot your hardware is. This is why overclocking requires extra cooling, and why gaming cases provide extra space for additional fans and vents. The goal is to keep your components as chilled as possible – which is why you probably shouldn't have a thick layer of dust inside your GPU fan or CPU heatsink.

Dust makes components inefficient, and worse – it can make them noisy as well, by forcing them to run at full speed all the time, or worse, unbalancing fans on their bearings so they rattle. Clearing out the dust will result in a performance improvement, even if it's only tiny, and will also improve the lifespan of your expensive (and less expensive) components.

All you need to do is remove the side or of your case and blow the dust out of your fans using a can of compressed air. You can use a lightly damp cloth to wipe dust off non-electrical components, but any liquid has the potential to corrode or otherwise interfere with circuitry, so don't mix the two if you can help it! Finally – and it should go without saying, but doesn't – don't ever take a vacuum cleaner to your PC. They build up static and can seriously damage hardware! **mm**

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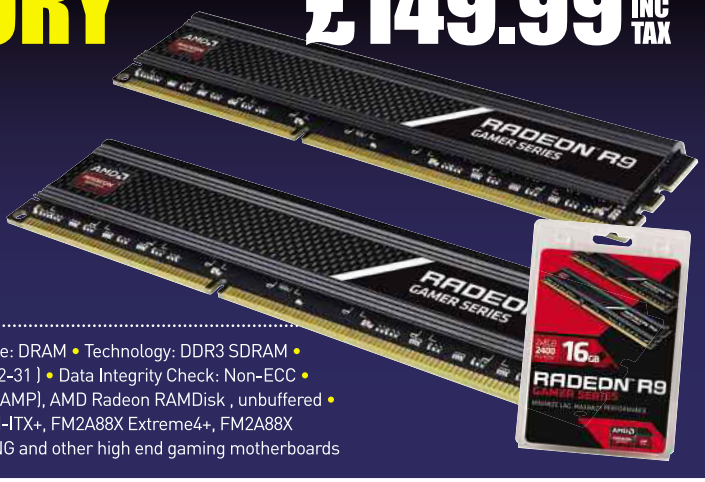
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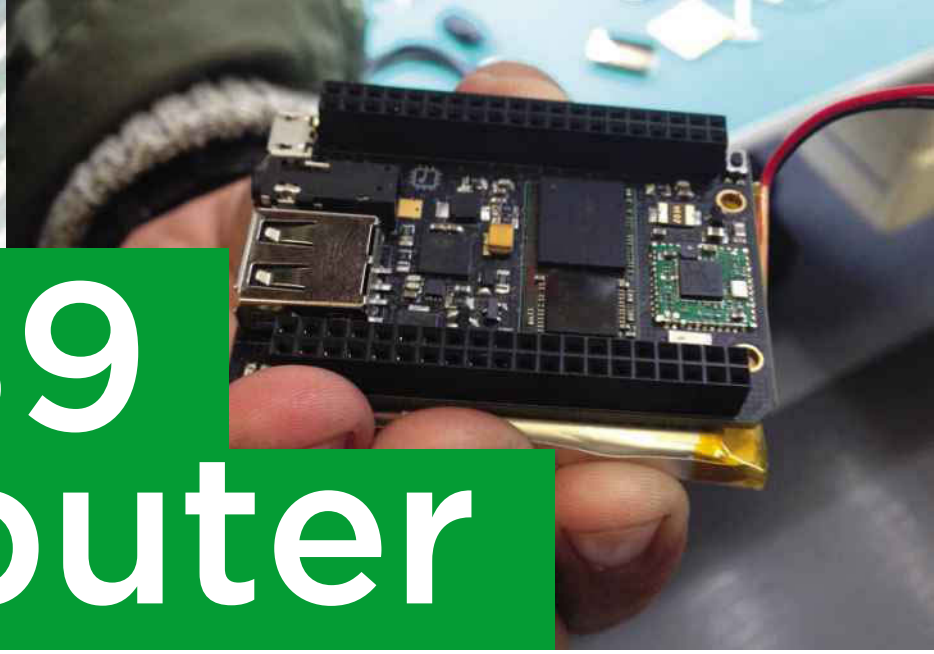
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The $9 Computer

David Briddock investigates an amazing value for money computer

What's the right price for a barebones system-on-a-board computer? With well over five million boards sold so far, the Raspberry Pi certainly hit a sweet spot with its $35 offering. The original Model B has now been joined by the Model A , the Model B+ and most recently the significantly more powerful Raspberry Pi 2.

Yet the original Raspberry Pi board dates back to 2006, and the initial launch was way back in 2012. Over the intervening years there's been a revolution in the Maker Community and a surge in commercial interest on the potential of the Internet of Things (IoT) domain.

Nevertheless, the Raspberry Pi has always been one of the cheapest options for a fully functioning computer, and not long ago the non-profit Raspberry Pi Foundation reduced the Model B+ down to just $25.

But soon that may not be cheap enough. By the end of this year, there'll be another open-source contender for the computer-on-a-board crown. And this time the price is just $9.

Next Thing Co

The $9 computer idea came from a small band of like-minded individuals who run what's called the Next Thing Company (**nextthing.co**), which already has a track record in the IoT and maker arenas. Ironically, this reputation has been built with value-added solutions for the Raspberry Pi platform.

Next Thing Co products target hardware hackers, makers and innovators. One example is OTTO, a hackable camera built on the Pi (**nextthing.co/otto.html**). Then there's STAK, an advanced system framework that deliver four-second boot times, reliable wi-fi, protected user program space, Git code integration and much more (**nextthing.co/stak.html**).

But now the team is working on replacing the Raspberry Pi altogether with something they call the C.H.I.P. project.

Kickstarter Phenomenon

These days if you have an original idea that needs funding, you don't pop into your high-street bank and try to negotiate a loan. Instead you use the power of the internet and in particular the Kickstarter website.

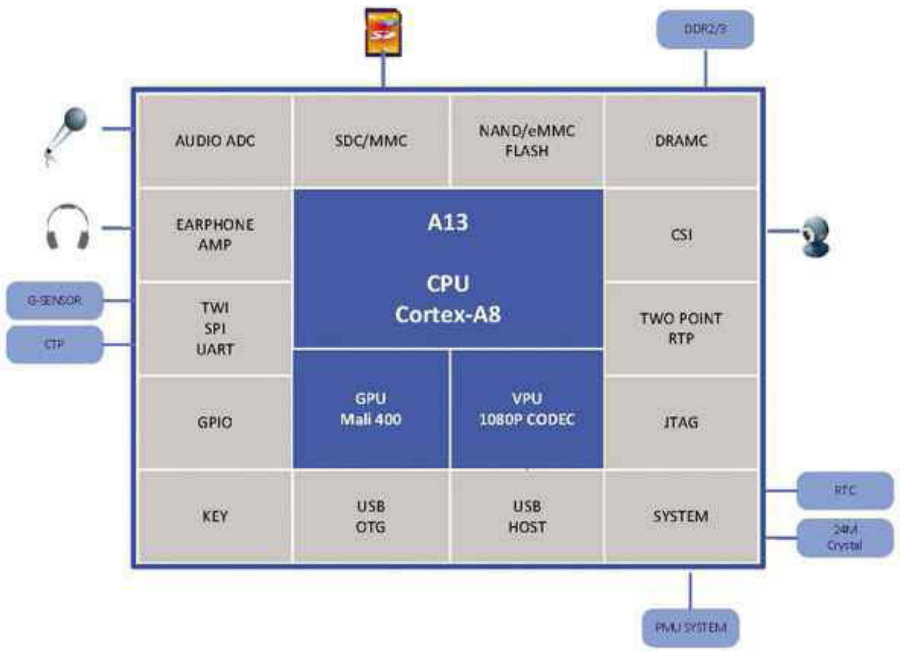
The original C.H.I.P. Kickstarter (**goo.gl/7R9qes**) goal was to raise $50,000. This figure would allow the team to purchase individual components in sufficient quantities to achieve that attractive $9 price target.

Of course, part of the attraction of backing a Kickstarter project is that you'll receive some goodies. Apart from the basic $9 C.H.I.P. board, you could pledge more for battery packs, VGA or HDMI adapters and even the PocketC.H.I.P. device (more on this later).

Yet, as we've seen before, even some great Kickstarter ideas fail to achieve their funding targets. So was it a success?

Yes, a rip-roaring success! When the funding period ended, on 5th June, a total

> **"The C.H.I.P. has an ARM Cortex-8 compatible 1GHz Allwinner A13 CPU and an ARM Mali400 GPU"**



of 39,560 backers raised a little over $2 million, so there's absolutely no doubt the C.H.I.P. board will become a reality. And there's bound to be a further swell of public interest when the hardware modules begin to ship.

Inside The C.H.I.P.

All the essential components are housed on a tiny board. At just 60mm by 40mm it's quite a bit smaller than a Raspberry Pi. However, this board still has a powerful System-on-a-Chip package with an ARM Cortex-8 compatible 1GHz Allwinner processor and an ARM Mali400 graphics processor. The graphics capabilities support HD decoding of 1920 x 1080 video at 30 frames per second, plus the H.264, H.263, VC1, MPEG1/2/4,VP6/8 and AVS video decoding formats, with both 2D and 3D acceleration.

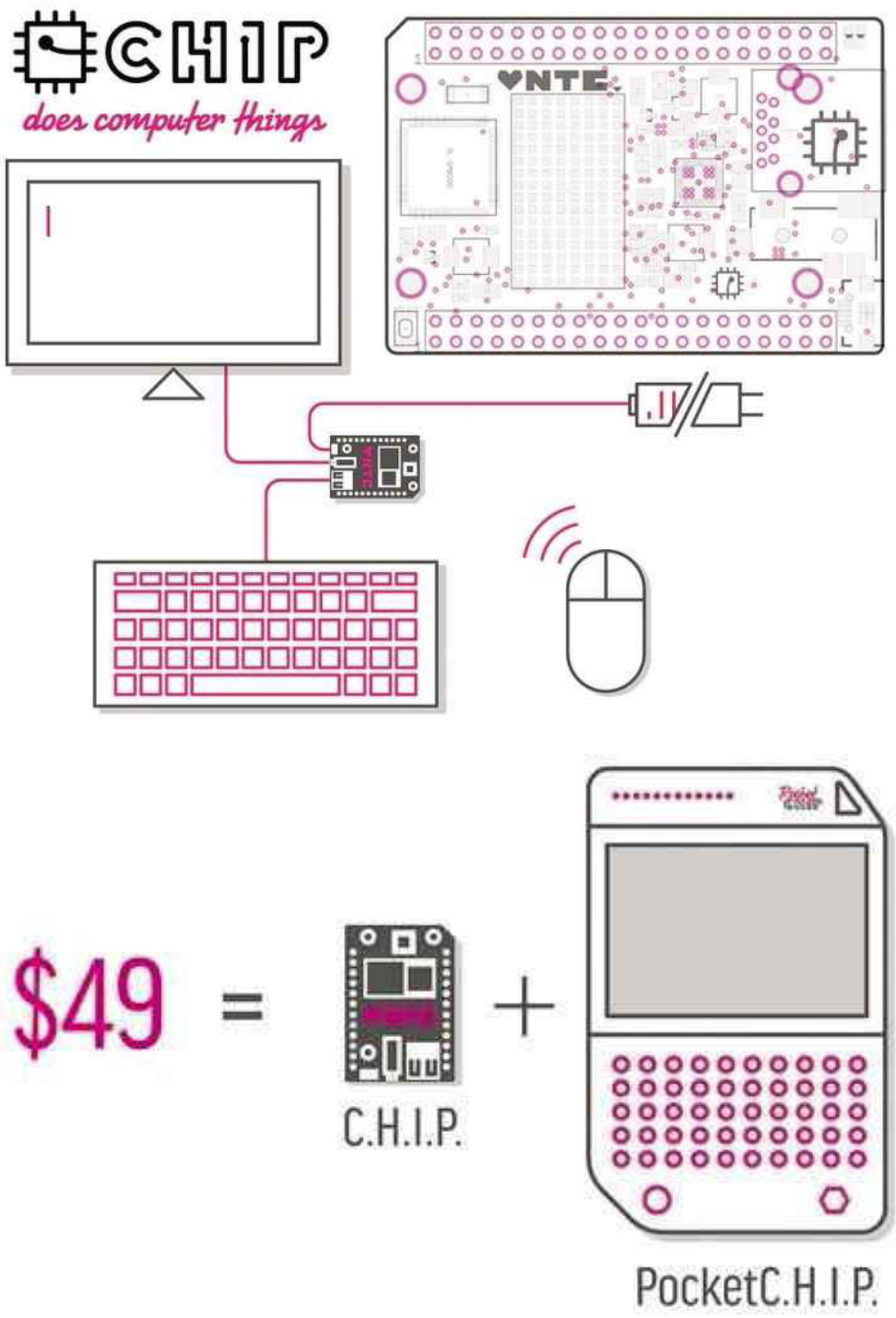
There's also 512MB of DDR3 RAM plus a generous 4GB of NAND flash storage (in contrast to the Raspberry Pi, which needs a separately purchased memory card).

Around the sides there's both full-size and micro-USB sockets, plus a multifunction composite-video / audio-out / microphone-in port (HDMI and VGA adapters are also available), while the twin 40-pin IO sockets deliver a host of I2C, SPI, UART and GPIO interfacing options.

Unlike the Raspberry Pi, there's built-in wireless communication. Wi-fi 802.11 (b/g/n) and Bluetooth 4.0 mean you can connect to the internet via a local wi-fi router and use a wireless keyboard/mouse setup or games controller. And there's even native support for a 16 million colour 4.3" to 8" LCD screen and a camera.

The fully integrated battery power circuit ensures complete portability. Just attach a 3.7V LiPo battery to a couple of the IO pins and off you go.

So the C.H.I.P. certainly has plenty of capability: the processing power to run everyday apps and a full graphical user interface, plus the on-board storage to hold data, images and media files. In summary, it's excellent value for money.



Software

As you'd expect from an open-source project, it runs Linux. In this case it's a fast-booting Debian-based Linux operating system, with drivers for standards like the 2D-based OpenVG 1.1 and the 3D-centric OpenGLES 2.0, plus over-the-air update support.

As for apps, there's plenty of pre-installed functionality. Use the Chromium browser to surf the web, manage your inbox, watch YouTube videos and much more,while LibreOffice makes it easy to create and manage your documents and spreadsheets.

But this is only a start. Running Linux means you can install thousands of free open-source community apps. For instance, photo manipulation or painting programs, music library managers, music production studios (using a USB MIDI keyboard) and new or retro-style games.

And if you'd like to write your own apps, just about any coding languages can be installed, including Python, Java and C++. Alternatively, you could create animations and games with the pre-installed block-based Scratch language.

Open Source

These days, it's essential to have an open-source mindset. This ensures the community will help to deliver updates, extensions and enhancements – something a single company cannot hope to manage by itself.

As we've seen, the software is exclusively open source, but with the C.H.I.P. it applies to the hardware too. All the hardware design files, schematics, circuit board layouts and even the bill of materials are free to download, modify and use.

This openness is the result of a close collaboration with the Allwinner Technology team (**allwinnertech.com**), who created the System-on-a-Chip (SoC) design (**goo.gl/UXA6E8**).

So whether you're a Linux kernel hacker, app developer, electronics wizard or inspired device maker, you can become deeply involved in the C.H.I.P. community. And for hardcore Linux developers, there were 1,000 'special backer' packages that deliver an alpha-level C.H.I.P. prototype this September.

PocketC.H.I.P.

One of the unique features of the C.H.I.P. Kickstarter offering is the PocketC.H.I.P. kit. What you'll receive for your pledge is a rugged injection moulded shell, 4.3" (470 x 272 pixels) resistive touchscreen, a full QWERTY keyboard and a 3000mAH battery – plus of course the C.H.I.P. board.

The battery is good enough for five hours' playtime and the whole thing slips into your back pocket. The C.H.I.P. board itself neatly snaps into a socket, located behind a removable hatch. Hardware hackers will be pleased to know the design ensures the GPIO pins are still accessible.

All in all, the case is rather reminiscent of the pocketable Nintendo GameBoy device. You can, of course, still use it to play games. But with its full 'qwerty' keyboard, you can browse the web, send communications and anything else a Linux-based computer can do. And it would make a neat remote control handset for robots, drones, game-consoles, TVs and a host of other electronic devices.

Availability

When can we get our hands on this $9 computer? In general 2015 is all about refining the hardware and software. There will be that alpha-level release we talked about in September, but the first production manufacturing runs don't take place until November, so we'll have to wait until early 2016 before delivery volumes start to peak.

And that's the problem with Kickstarter projects. As 2016 is still some distance away, there's plenty of time for something else to happen in the maker/IoT domain. For instance, there may be further Raspberry Pi price cuts or other secret, yet close-to-production rival technology that will vie for exactly the same marketplace.

C.H.I.P. Vs Pi

The big question is: should you go for a C.H.I.P. or a Raspberry Pi? The C.H.I.P. is already around a third the cost of a Raspberry Pi B+ and almost a quarter the price of the new Raspberry Pi 2. Yet the Pi doesn't come with 4GB of flash storage or built-in wireless support. All in all, the value for money that the C.H.I.P. delivers is quite staggering.

Obviously, the Raspberry Pi community is huge, and despite the attractive cost, it may be impossible for a C.H.I.P. to create a similar worldwide momentum. And there are a host of Pi accessories, add-ons, books, magazine articles, online tutorials and videos already available.

But the maker community and IoT domain simply cannot ignore such a capable, low-cost product, while clever ideas like the PocketC.H.I.P. kit are bound to raise its profile. And with over $2 million to play with, there may well be some other cool (and highly newsworthy) add-ons in the pipeline.

In the end it's not a straightforward decision, but just about anyone can find a spare $9, so why not buy a C.H.I.P. anyway? **mm**

Full C.H.I.P. Specification

- 60mm x 40mm board
- 1GHz ARM Cortex-A8 Allwinner A13 CPU
- ARM Mali400 GPU
- 512MB DDR3 RAM
- 4GB NAND flash storage
- 1 full-sized USB
- 1 micro-USB (OTG)
- Wi-fi (b/g/n)
- Bluetooth 4.0
- Stereo audio and composite video
- 2x40 pin IO (I2C, SPI, UART &GPIO)
- Camera sensor support (MIPI-CSI)
- Native 4.3 to 8 inch LCD screen support
- Integrated battery power circuitry (3.7v LiPo)

Allwinner Technology

Founded in 2007 Allwinner Technology is a successful fabless design company located in Zhuhai, China. It specialises in smart application-processor System-on-a-Chip (SoC) designs and smart analogue integrated circuits (ICs).

Allwinner chips deliver raw processing power through high-performance, multi-core CPU/GPU integration, cutting-edge UHD video processing and ultra-low power consumption technology.

The extensive product line includes 32-bit and 64-bit multi-core application processors for smart devices, including the 10-strong A series plus the H, V, R and F series. These SoC designs are supplemented by a range of smart power management ICs.

Its products often appear in well-known computer brands around the world. In fact, you may already have Allwinner technology in your smartphone, tablet, internet TV, wi-fi, router, home automation device or car.

"One of the unique features of the C.H.I.P. Kickstarter offering is the PocketC.H.I.P. kit"





How 3D-printed rats could offer schools a vegetarian dissection

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A fresh take on technology

Component Watch

Component Watch

1TB of SSD storage may not cost as much as you think...

High capacity SSDs are becoming increasingly affordable as the market shifts and changes to reflect ever-decreasing production costs. That means there's less of an excuse than ever to not own one. That's not to say you can't do better than the prices most retailers charge off the shelf, however. That's why, for this week's Component Watch, we're looking at the best prices we can find for 1TB SSDs, so that you're never paying over the odds for the next generation of PC hardware.

Deal 1: Transcend SSD370 1TB
RRP: £279 / Deal Price: £260



Considering it's one of the cheaper 1TB drives on the market, the Transcend SSD370 has a huge capacity and super-fast access – with maximum speeds for 570MB/s read and 470MB/s write. Add to that the fact that it's just 7mm thick and weighs in at just 52g, and you can understand why it's perfect for ultrabooks and notebooks, but just as comfortable in a desktop system as well. This is a great price for what is, ultimately, a very competitive value-market SSD drive.
Where to get it: eBuyer (**bit.ly/1gbPhiz**)

Deal 2: Crucial MX200 1TB
RRP: £355 / Deal Price: £280



While it's only a little more expensive than the Transcend SSD370, the Crucial MX200 1TB comes with Crucial's significantly more recognisable pedigree, and offers slightly more balanced access speeds – 555MB/s read and 500MB/s write. According to Crucial its endurance rating is whopping five times better than the average of similar Samsung, SanDisk and Intel drives that it directly competes with, and its substantial hardware encryption capabilities make it all the more attractive for anyone who can afford the extra £20 over Transcend's model. At the end of the day, it's really hard to look past that tasty £75 saving you'll get here compared to the £19 difference in the SSD370 price.
Where to get it: eBuyer (**bit.ly/1HxZwtp**)

Deal 3: Samsung 850 PRO 1TB
RRP: £487 / Deal Price: £370



Samsung's SSDs are consistently great, and the 850 PRO is no exception to this rule. 550MB/s write, 520MB/s read and Samsung's proprietary 3D V-NAND make this a drive on the cutting edge of its class even though it's priced better than some others – at least if you can find a discount. Self-encrypting and with superb power management, it's a clear cut above all value SSD drives – and most of its rivals too.
Where to get it: Novatech (**bit.ly/1IP0gFt**)

Deal 4: Kingston V310 SSDNow 960GB
RRP: £389 / Deal Price: £377



The Kingston name is virtually synonymous with memory, so it's no surprise their high-capacity SSD is great as well. 450MB/s read and 450MB/s write speeds mean it could be faster, but what it loses in access times it makes up for in reliability and usability, and it has a three-year warranty on top of all that. If you value refined quality over raw performance, the Kingston V310 has what you're looking for.
Where to get it: Box (**bit.ly/1LVEDGp**)

Deal 5: Corsair Neutron XT 960GB
RRP: £423 / Deal Price: £414



Aimed at data-heavy professional and gaming use, the Corsair Neutron XT is the fastest drive we've looked at, with 560MB/s read and 540MB/s write speeds – fast enough to capture uncompressed 4K in real time. You won't find a faster and more consistent drive, and its huge selection of data protection features make it all the more attractive. If you've got the money, we'd struggle to recommend a better SSD.
Where to get it: Dabs (**bit.ly/1JxpdrM**)

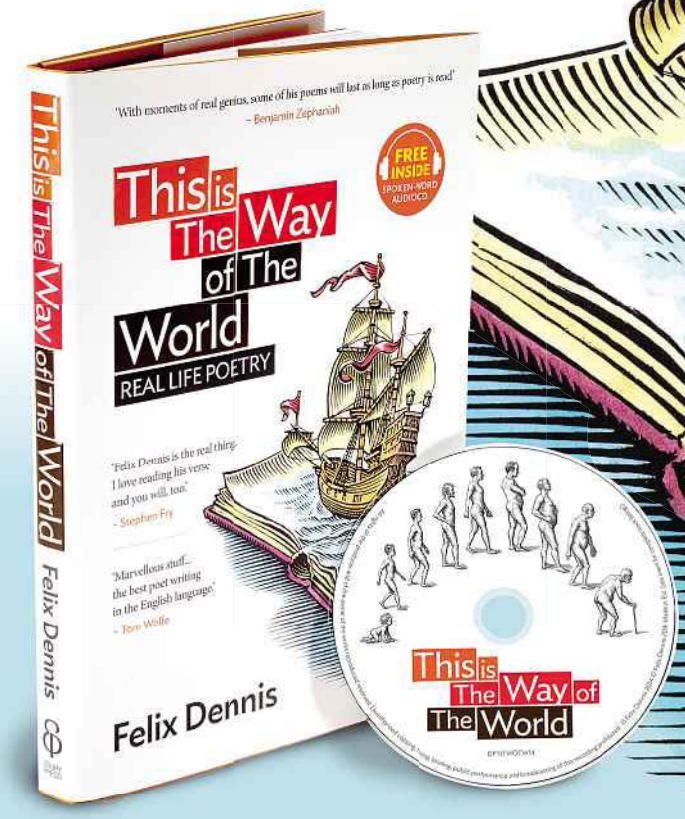
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Man Builds Super-sized 16-bit CPU

ARCHOS' Addition To PC Stick Brigade

HDMI drive comes with a kick

We've covered a few PC Sticks in the news of late, and here's yet another one. Coming from French brand ARCHOS, this particular take on the form promises the usual thing – the power of a PC in a compact drive. Weighing it at under £79, the ARCHOS PC Stick can be carried around in your pocket and can plug into any display with a HDMI input. What's more, as it's kitted out with Bluetooth connectivity, this can be controlled via keyboards, mice and other accessories. Keyboard apps and game controls on Windows, Android or iOS devices are an option too, transforming any smartphone or tablet into a compatible keyboard.

As for the technology behind the drive, it features an Intel Quad-Core Atom 1.33GHz processor, 2GB RAM, 32GB storage and a micro-SD card slot. Running Windows 10 right out of the box, MS Office apps are pre-installed and there's support for Cortana and multiple desktops too.

No definite word on the release date as yet, other than it will be available for the kids going back to school. The website to buy it when it is out is **www.archos.com**.



QUICK BITS... **A Mechanical Story won the 2015 British Academy Cymru Award for Games & Interactive Experience at**

Home build goes one step further

A Cambridge man has taken his system build to the next level by attempting the task of putting together a own processor from off-the-shelf components. James Newman told the BBC that the project, which currently take up about 45ft of his home, had taken him three years to date and that the financial outlay on this has reached £20,000.

The 16-bit processor uses 14,000 transistors and 3,500 LED lights and was built by Newman, a digital electronics engineer, because he "wanted to be able to see how a computer works and how things flow around within it."

He's hoping to have everything completed by the end of the year, though there is clearly a storage problem here. Putting that to one side, we can't fail to be impressed with his fine efforts on this one. Well done, Sir!

Edifier Goes Back To The Studio

Two new models to speaker range

Consumer audio electronics outfit Edifier has added a couple of speakers to its Studio range. Available through the usual retail outlets, the R1700 BT and the R2000DB promise to provide consumers with a cracking audio experience on the back of a strong, elegant design.

The R1700BT (pictured), available for around £118, are powerful studio speakers producing 66W RMS from their 4" bass driver and 19mm tweeter driver. A front-facing bass reflex port emphasises lower frequencies, allowing for richer bass performance, while the speaker also incorporates Digital Signal Processing and Dynamic Range Control to prevent distortion levels at louder volumes.

The R2000DB delivers powerful audio for PC and gaming consoles with devices connected using the RCA-RCA or RCA-AUX audio cables for versatile and dual connection options at the same time. Optical, Bluetooth and dual RCA inputs are also included for connectivity to multiple audio sources.

So, **www.edifier-international.com** is the site for more details if they sound of interest.





It seems like barely a week goes by that doesn't feature some technology company or other misbehaving, either towards its competitors or its customers.

This time round, it was Samsung's turn to put its foot in it, when it was discovered that it had disabled Windows Update, in spite of what its customers might actually want.

Frankly, I'm tired of talking about stories like this, so let's not focus on such things for now. Let's just be happy we have interesting new products like a $9 computer coming our way, which like many intriguing projects these days, is using Kickstarter to get off the ground.

Whether or not you've ever backed anything through a crowdfunding site, you can't deny that it's helping to foster innovation – a welcome distraction from what the big names seem to be up to.

Until next time,

Anthony

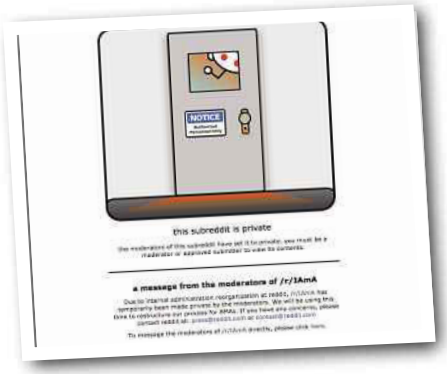
Editor

Meanwhile... On The Internet...

Last week was punctuated with a couple of stories about Twitter Q&A sessions gone wrong – specifically those of *50 Shades* writer EL James (**tinyurl.com/MMnet70a**) and Republican presidential candidate Bobby Jindal (**tinyurl.com/MMnet70b**), both of which make us wonder exactly what their PR teams thought was going to happen. But nothing prepared us for the fall out of the less-than-perfect Jesse Jackson AMA hosted by Reddit (**tinyurl.com/MMnet70c**).

Within 24 hours of that fractious, confusing online exchange, the site had sacked one of its most successful and popular members of staff, Victoria Taylor. It was a move that, considering her central role in coordinating and running what has become one of Reddit's central selling points, many instinctively linked to the events of the previous day. However, rather than closing a less-than-illustrious chapter in Reddit's history, it served as the introduction to a much more worrying one for the company.

In response to Taylor's dismissal and other actions by the Reddit management team, Reddit's volunteer moderators moved to effectively shut down some of the site's most popular subreddits by making them private – including r/movies, r/askreddit, r/videos and r/science (**tinyurl.com/MMnet70d**). This appears to be the latest skirmish in an increasingly fractious relationship between the owners of Reddit and the people that make the site tick. Despite conciliatory words from founder Alexis Ohanian (**tinyurl.com/MMnet70e**), which became something of a discussion forum on what quickly became dubbed AMAgeddon, as we write, some of the subreddits mentioned are still inaccessible. What's more, the user responses to Ohanian's assurances in regards to the ongoing relationship between Reddit's management and mods seem less than confident of the management team's promises (Reddit is now owned by publisher Condé Nast) and increasingly read like an us-and-them stand-off tainted by lack of trust.



Over the last few month's, we've run a few stories that seem to amount to a trend indicating Reddit's attempt to clean up its act. However, it would seem its tactics are increasingly alienating the people that made it what it is – and it will be interesting to see how it tries to square the circle between returning for its investors and keeping Reddit's spirit alive in the eyes of those that have driven its use.

A recent post on The Intercept has detailed exactly how the NSA's now-infamous XKEYSCORE monitoring search works (**tinyurl.com/MMnet70k**), dubbing it "Google for the world's private communications". Let us tell you friends, it's quite the thing. As far back as 2009 it was operating as a 'full-take' data collection system, holding everything it slurped up from fibre-optic cables around the world for three to five days, and the metadata recording those interactions for up to 45 days. What's most worrying about that, though, is how far it may have come on since then. Indeed, commenters on Bruce Schneier's security blog were wondering whether advances in storage means that metadata is now stored indefinitely.

Anyone, ourselves included, who was optimistic that the recent decision of the FCC to defend net neutrality across US would lead to similar sentiments over here probably sighed long and loud when they read stories about the 'trilogue' meeting establish rules governing internet provision in the EU (**tinyurl.com/MMnet70f**).

While factsheets (**tinyurl.com/MMnet70g**) pitched the EU's commitment to the 'Open Internet', it also told us that "services like IPTV, high-definition videoconferencing or healthcare services like telesurgery" could be considered "specialised services", to which telecoms providers will be able to offer "innovative services" to ensure "enhanced quality". Exactly what that worryingly vague wording means in reality, though, will remain to be seen. We'll bet it's not great, though.

Aaaaaand Finally...

The year-long exchange between graffiti artist Mobstr (**tinyurl.com/MMnet70h**) and his local council is a thing of beauty (**tinyurl.com/MMnet70j**). The fact that somebody GIFd it, just makes it better (**tinyurl.com/MMnet70i**). GIFs, we so often find, simply make everything better.



.AVWhy? Videos For Your Eyes... Not Necessarily For Your Brain

Any of you who didn't see Nintendo's delightfully surreal introduction to its E3 Starfox presentation should probably watch that (it's here: **youtu.be/glUEKwjqMKw**) before you head off to this delightful little film that documents the visit of legendary Mario designer Shigeru Miyamoto to the home of the Muppets (**youtu.be/4ANzA2fQ8Gc**).

QUICK BITS... Facebook's female worker population has risen by just 1% in the past year according to the company's

Caption Competition



Rarely have we seen a man happier than when he has a soldering iron in his hand. Then again, we really don't get out enough. Anyway, captions!

- **Thomas Turnbull: "**Well I've replaced the capacitors on this iPad but I'm going to need a bigger case"
- **Sawboman:** "Someone said it was really cool hardware, this should warm it up a bit."
- **BullStuff:** "According to the voices in my head from Andromeda, this last connection should do it!"
- **BullStuff:** "Jason Statham in Hobby Mode."
- **doctoryorkie:** "Board geek."
- **pesukarhu:** :Oh, look, this huge soldering iron is leaking enough current to actually power up the circuit board being soldered on!"
- **JayCeeDee:** "Having lost his sonic screwdriver, the Doctor found himself stuck in the 70's, trying to repair the Tardis."
- **Think Tank:** "And you thought Brains from Tracy Island was a puppet."
- **Alex Best:** "Jim Bowen's secret life as electrical engineer."
- **James Matthews:** "'They said the fumes from this lead solder were dangerous. I'll show them,' said Harry to the tiny pink giraffe sitting on his desk."

Thanks for all the entries, and congrats to Dennis Tree, who suggested, "Nothing was working, but Fred kept soldering on."

To enter this week, head to the 'Other Stuff' section of our forum (**forum.micromart.co.uk**) and say something funny (but not too rude) about the picture below or email us via **caption@micromart.co.uk**.



Gmail Introduces 'Undo Send'

Take back what you didn't mean

So here's a useful addition to Gmail's webmail service that we think will truly be welcomed by many of its users. Ever wanted to recall an email you wish you'd never sent? Perhaps you posted in a rage. Perhaps you were a wee bit tipsy. Perhaps you just pressed Send on an email that you were still drafting.

Whatever the reason, Gmail has just given you a get-out. The service has now introduced an "Undo Send" feature for all, and you'll need to switch it on within the Settings menu as it's turned off by default. The timescale on the actual "Undo" can be set between five and 30 seconds and it's coming to the masses after having been successfully trialled on Labs.

So Gmail users have no excuse for sending out embarrassing emails anymore.



Self-Driving Car, Meet Self-Driving Car

Near-collision in America

What happens when rival self-driving cars meet on the roads of California? Well, on this occasion it was a near miss as an Audi owned by Delphi Automotive was reportedly forced to take "appropriate action" to avoid a Google self-driven vehicle.

While Reuters reported the incident as an unintentional close-call, the companies themselves dismissed such talk, spinning the incident as a typical meeting of cars on a road, interacting and what-no. For its part, Reuters is standing by its take.

For the rest of the world, the idea of self-driving cars doesn't get any more palatable.

Snippets!

BBC Publishes Link List

The BBC has published a list of links that were removed from Google searches as part of the European Court of Justice's 'right to be forgotten' ruling. Publishing the full list of stories removed to date, the Beeb's head of editorial policy has stated that it will continue to do so, saying "It's impossible to have a meaningful debate if you've not got an idea about what's being de-listed."

Bad Home Email Habit

GFI Software carries out an annual study into email user habits and its third one is out. The big revelation this time around is that workers are increasingly taking their business life home with them, with 47% of respondents admitting that they checked email at least once a day during their personal time, with 33% saying that they checked multiple times a day. Worse still, 43% check regularly after 11pm at night.

They might be quick at dealing with their emails, though – a quarter felt compelled to reply to work emails within quarter of an hour of receiving them.

Fibre Range Boost?

A team of researchers from the University of California has claimed to have come up with a way of increasing the capacity of fibre optic cables. The team has gone about its business by removing frequency distortion to allow fibre lines to carry data over longer distances without the need for electronic repeaters. Ultimately, the upshot of the research is that they claim to have achieved sending an optical signal over 12,000km – that's a new record, in case there's any doubt.

Arkham Knight Pulled From PC

User complaints force title off shelves

Publisher Warner Bros has decided to pull the PC version of *Batman: Arkham Knight* after multiple gamers complained over performance problems. At the time of writing, there is no date set for when it's going to go back on sale, as Warner Bros has a whole lot of problems to sort out – with developer Rocksteady stepping in to get this done. If you've bought the game already, probably worth asking for a refund.

If you're a Steam user, or you frequent Reddit, you'll be aware of the chatter among the disgruntled ranks, unhappy at dodgy frame rates and crashes. Thing is, Warner Bros and Nvidia championed the PC version of the title before its release, boasting how a bunch of graphical features wouldn't feature elsewhere and that the PC version was where it was at. If that led to you going with the PC version over the PS4 or Xbox One, you're right to be mightily fed up with the publisher for all the hassle.



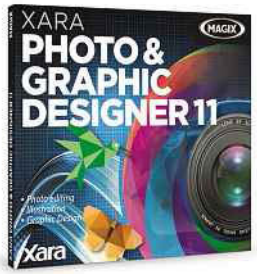
Xara Updates Photo Editing Package

New feature galore for graphics package

Xara has contacted us with news that it's been hard at work updating its graphic design and photo editing software, Xara Photo and Graphic Designer. Now at version 11, this easy-to-use package promises all you need for a range of graphic design and photo editing tasks, with Xara calling it "one of the most advanced and powerful" vector graphics programs around."

Key new features in this release include new Art Brush technology, stretching vector or bitmap images in real time along a freehand drawn line. The Shape Painter tool has been improved too, with extra flexibility from a new selection of editing tools, while there are also improved text features including autocorrect, text background and colour options.

With the ability to sync files via Dropbox and Google Drive, this new version also means that edits can be updated across multiple computers. And if the updated features themselves aren't enough, the package also comes with a couple of free additions – the Premium version of MAGIX Online Photo Album and the Photolooks 2 plug-in that includes 100 presets for changing colour and light effects in a photo. It'll set you back £49.99, or £20 for upgraders, from **www.xara.com/uk**.



QUICK BITS... **Atomic clocks added an additional second to the official time on the last day in June**

Siri Sends US Users To Police

9/11 requests redirects iPhone owners

The Regina Police Force in America has requested iPhone users don't ask Siri about 9/11, which can cause the phone to call the police. The problem, which took hold over one weekend in late June, was fuelled by a viral social media effort encouraging people to ask Siri about 9/11, with messages typically stating things like "Say 9/11 into Siri and you'll be amazed", or "When you say 9/11 to Siri, her response is hilarious".

That situation has been made worse by Siri users – shocked at being put through to the police – putting the phone down, upon which a police communications officer is obliged to call back and determine whether it' s a real emergency. This, of course, blocks up the phone networks,

The release on the matter said: "We are fortunate, so far, that there haven't been real 9-1-1 emergencies where help has been delayed. Please, choose to be a good citizen and DON'T ask Siri about 9/11."

Disney Bans Selfie Sticks

Quite right, frankly

Disney has banned selfie sticks from its theme parks around the world.

A spokesperson for the company has confirmed that it wants to ban the sticks over safety concerns for guests and staff. This decision comes after news broke of someone holding out a stick while riding a rollercoaster in California. Clearly, a massively dangerous act.

Can we not just ban selfie sticks everywhere because, you know, they're a bit naff?

Wanted: BBC Micro Men

Women too, but we really like alliteration...

The National Museum of Computing has launched a public appeal for help in looking after the upkeep of its BBC Micro machines.

The Museum wants people familiar with the 8-bit system and its many associated peripherals, which are an important part of the Museum's educational value. Head of Learning Chris Monk said: "We want to find out whether people have got skills out there that can keep the cluster alive as long as we can."

If you think that you have what it takes to help out, just visit the Museum's website at **www.tnmoc.org**. They would be only too happy to hear from you.

Microsoft's Office For Android Becomes Reality

Free versions of Office apps For Android phones

Any Android mobile users with a liking for Microsoft Word, Excel and PowerPoint can afford themselves a nice big smile, as Microsoft has now released free versions of its Office software. Available to download from the Google Play store, releasing Office for Android devices is part of the firm's ongoing commitment to getting Office on every platform out there.

If you're an Android user running anything below Android 4.4, however, you're out of luck. Furthermore, you'll need 1GB RAM. That means around half of Android phone users can't actually take advantage of Microsoft's latest delivery. Still, technology moves on...



Samsung: Errors Of Judgement

Coming on the back of Lenovo distributing malware, reports now reach us that Samsung is disabling critical Windows updates. Mark Pickavance gets to the bottom of these strange actions

Modern computing is a bit like siege warfare, once might reasonably conclude – because there seems an army of miscreant programs encamped outside every PC, trying to overrun it.

They're waiting for the first visible signs of cracks in the defensive structure, ready to launch a pre-emptive attack and charge inside.

In this war the PC has relatively few allies, but usually in their number you might count the PC maker, along with Microsoft and the creators of various malware and virus protection tools.

But if circulating stories are to be believed, not all those safe inside the citadel are as committed to its defence as it appears.

Samsung, of its own volition, decided to opt its PC customers out of all upgrades, including security patches, by releasing a software tool that's sole purpose is to disable Windows Update.

To better comprehend why it might do this, let's take a moment to cover how upgrades are handled on the PC, specifically those on branded machines.

Upgrades And The Branded PC

What's important to realise is that lots of hardware makers don't like generic drivers on their equipment. That's either because they have slightly modified from stock hardware that needs specific drivers to deliver the proper performance or they've tuned their drivers to deliver the very best possible experience for their customer.

I've run into this issue myself with Dell, when an update to *World of Tanks* stopped that game working on my Dell XPS 13 (2013). I reported the issue to the support line and was told to upgrade my Intel GPU drivers to the latest release to stop the game crashing on launch.

But when I tried to do that, the system refused, stating that the driver that was already on there was the 'optimal' one, and putting something else on there wasn't going to be allowed. Eh? Surely it's for me to decide, isn't it?

Eventually, I discovered a workaround and installed the latest Intel drivers, which in this instance worked fine and fixed *World of Tanks*.

However, what I'd probably discover is that if I tested the battery life, it wouldn't be as good as before, I surmise. Only Dell really knows, and it doesn't make that information public.

This situation isn't unique to Dell. Most of the PC makers do it, especially in respect of laptops, where they tweak all manner of technology for a perceivable performance advantage.

It's seems an odd thing to admit, but the latest drivers aren't always the best ones for your system. And, it's not just something specific to drivers. There's also a wider context where certain combinations of apps and drivers work better in concert.



Microsoft knows all about opt-out upgrade models, because it has a special service that it's created specifically to work with the hardware makers to allow precisely this type of variation. By working with Microsoft, hardware makers can make sure their equipment is fed the most wholesome mix of updates.

To facilitate this, there are two components that hardware makers need in place, one of those being the relationship with Microsoft that allows it to not send a specific update to the makers' PCs on a per hardware basis.

The second (and most PC makers have this) is a platform specific tool that downloads the drivers/upgrades that they do want installed that wouldn't come through the Microsoft release channel.

I'm not sure why this wasn't good enough for Samsung, because it seems to work reasonably well with HP, Dell and Asus, but for whatever reason, it decided it would plough its own furrow. Why it did this seems somewhat confused, but this is how the story broke.

Denial Of Service

As most maelstroms start life, this one began with two people trying to fix a PC problem with the usernames BrianDrab and wavly. It was wavly's Samsung PC that wasn't behaving and BrianDrab who was investigating why it kept disabling features that the users had set. These machinations were played out on a forum, Sysnative, where wavly was trying to understand why his Windows PC kept disabling updates.

As with all recent Samsung PCs, this system used a tool called SW Update, built by Samsung to deliver brand-specific drivers and installs to computers it built. Actually, you can install it on any brand of PC you like, but that probably isn't recommended if you're tempted to use it.

After much elaborate investigation organised by numerous individuals, involving the deployment of auditpol.exe and registry security auditing methods, a program was identified that kept turning system update off. That application went by the remarkably apt title of Disable_Windowsupdate.exe, and very worryingly it is part of Samsung's SW Update software.

For those who might be affected by this, I should also point out that they found that removing SW Update via the control panel does indeed stop this potentially dangerous tool from working and allows you to re-enable Windows update unhindered.

Where this story gets stranger is that when approached about why it might do this, Samsung denied that it had done anything of the sort. It issued a statement, saying "It is not true that we are blocking a Windows 8.1 operating system update on our computers ... As part of our commitment to consumer satisfaction, we are providing our users with the option to choose if and when they want to update the Windows software on their products."

What's strange about this statement is that at no point did anyone suggest that the Windows 8.1 operating system update was blocked, though Samsung wanted to vehemently deny that it had done that for good measure.

It was patently obvious at this point that having kicked this particular hornets' nest and seen how Lenovo got publicly stung for its 'Superfish' fiasco, it wanted to deny having done anything, even if it wasn't very sure what it was it had done.

Soon Microsoft chimed in, which didn't help matters from Samsung's perspective. Microsoft said, "Windows Update remains a critical component of our security commitment to our customers. We do not recommend disabling or modifying Windows Update in any way, as this could expose a customer to increased security risks. We are in contact with Samsung to address this issue."

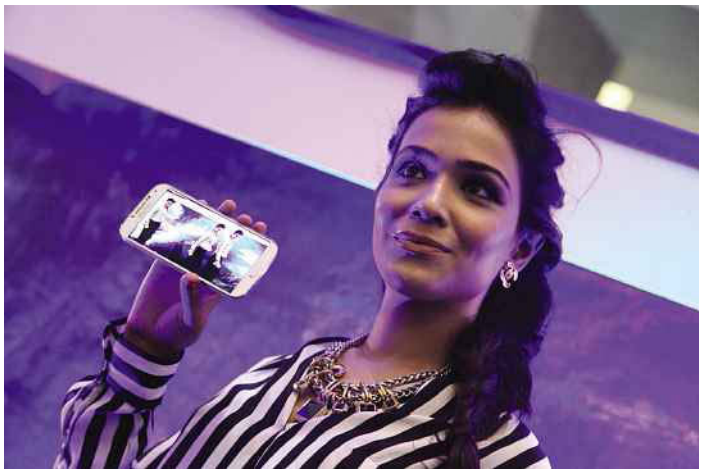
Oops. How wrong did that go? Not only did it annoy its customers, but it's also incurred the wrath of the company that makes the OS it decided to mess with.

"This is the sort of hubris that seems endemic in the world of technology, where users get told that a design flaw is them 'holding it wrong'"

Soon, Samsung was backpedalling furiously, when it was clearly documented that it had made an update disabling app, installed it on customer machines and then claimed zero responsibility.

It issued a new statement with a more consolatory tone:

"Samsung has a commitment to security, and we continue to value our partnership with Microsoft. We will be issuing a patch through the Samsung Software Update notification process to revert back to the recommended automatic Windows Update settings within a few days. Samsung remains committed to providing a trustworthy user experience and we encourage customers with product questions or concerns to contact us directly at 1-800-SAMSUNG."



Since then, a back-channel excuse has emerged. Apparently, it realised an update might disable USB3 ports on some of its PCs and decided (in a panic, one assumes) that it should disable Windows Update to stop that happening.

That doesn't really explain how sane technical people made that call, or how Samsung issued a public statement that was factually incorrect, but it's yet another piece of this bizarre jigsaw.

SuperFish revisited

The parallels between these events and Lenovo's SuperFish debacle are striking, not because Samsung distributed malware, but because of the attitude that generated the problem. That then coloured its initial response to the public outcry, turning a big problem into an even larger one.

What appears to go wrong at some level in these companies is that they get confused about who it is that owns the computers they're messing with. Having Lenovo or Samsung branding on a product doesn't actually establish it as sovereign territory, like the grounds of an international embassy, where they can do what they like because a small part of the computer is still owned by them!

Lenovo, for entirely inexplicable reasons, thought that the computers of its customers were a fertile commercial opportunity to be exploited at will. And now we have Samsung deciding that it knows better than both Microsoft and the machines' owners, regarding what's better for it upgrade-wise.

This is the sort of hubris that seems endemic in the world of technology, where users get told that a design flaw is them 'holding it wrong', or ignoring extensive feedback that contradicts already set-in-concrete plans is par for the course.

Releasing something like Disable_Windowsupdate.exe or SuperFish is indicative of people operating in a bubble, where customers have spent their cash can be treated in whatever way the company decides is best for it.

In Samsung's world, customers are those annoying people who screw their computers up and then expect technical help, and if it had a choice, the whole machine would be locked down with the exception of its own SW Update.

As for Lenovo and SuperFish, that all seems a distant memory to that company. It's still loading ridiculous amounts of crapware onto its PCs despite getting negative reviews for doing so and against the obvious wishes of its customers. If there was a lesson learned by it, it was probably not to get caught, rather than to treat its customers with respect.

We've had SuperFish and now Disable_Windowsupdate.exe, so which PC brand will be next to step on the landmine of customer relations with its size-13 hobnailed boots?

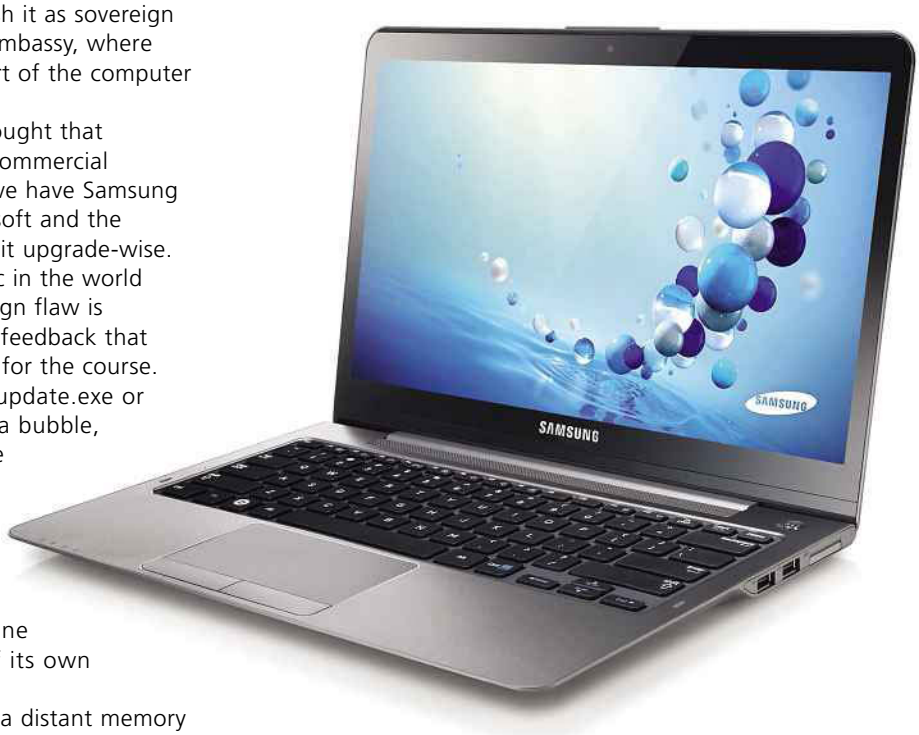
Final Thoughts

Now in the space of just a few months we've had two extremely poor judgements made by PC makers in consideration of their paying customers. Although there's a track record here, with this coming just ahead of the Windows 10 launch, Microsoft in particular must be finding these actions a little concerning.

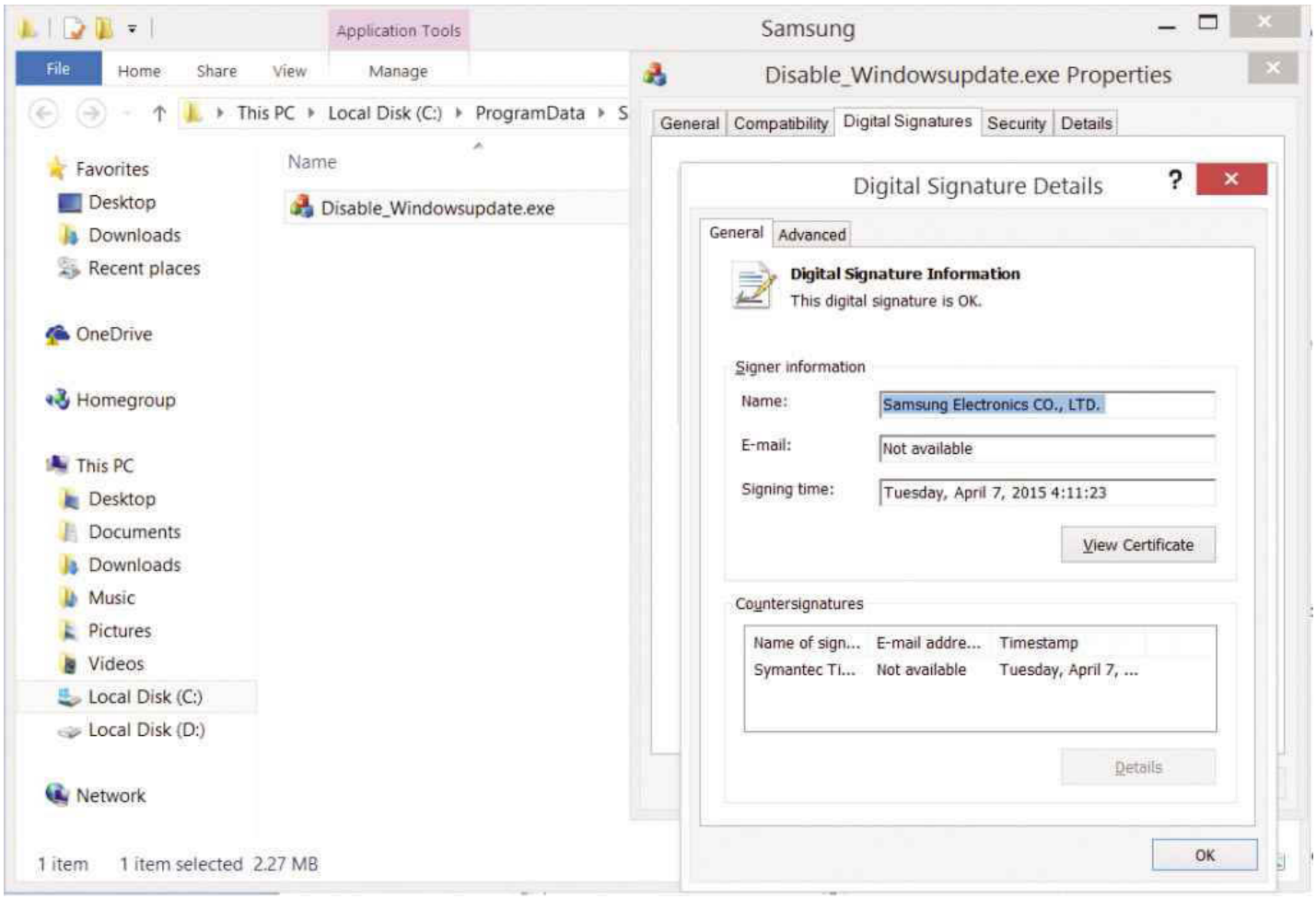
In both instances, the only reasonable conclusion that can be drawn is that these were decisions made by senior people in these companies, who either never use computers or who have no real understanding of how they work and are used. The rationale of turning off updates to protect users in Windows is massively flawed however you spin it, given the continually evolving threat of malware.

What it also highlights is an increasing void forming between some hardware makers and those that create the operating

"In the world of phones, upgrade control has been debated for some time, unless you're talking about Apple, which gave itself this weapon from the outset"



That's a nice Samsung notebook. But is it your notebook or Samsung's, merely on loan to you?



Samsung tried foolishly to deny that the application Disable_Windowsupdate.exe was anything to do with it – even though it was provided with a Digital Signature by Samsung Electronics CO., LTD. Nice try. Would you like a second go at that, Samsung?

system about what's best for the computer buying public. Samsung in particular seems to be making some disturbing noises in regard to Android, voicing an intention to fork the OS and go its own way with a wholly distinct and potentially incompatible offshoot.

While it's entirely within their rights to do this, it does suggest that someone in that company thinks of the OS in its phones and tablets as being much like petrol to car makers. Does it really matter what brand you use? This thinking entirely flies in the face of why Android has become so successful – i.e. because most devices can run most applications in the Play store – and that power should never be underestimated.

But coming back to disabling updates for your own advantages, this is an ongoing battle that is beginning to rage across multiple platforms. Who is it exactly that controls upgrades and keeps everything consistent? In the world of phones, upgrade control has been debated for some time, unless you're talking about Apple, which gave itself this weapon from the outset. Conversely, both Android and Windows Phones have application upgrades from Google and Microsoft respectively, but system upgrades from their network suppliers.

This has caused all manner of problems, mostly because networks are in the business of selling new phones and contracts, not making your old one work even better than before. Because of this, they've generally been obstructive with system upgrades and in many cases failed to pass on new versions of the OS, even if they've been created for existing hardware.

What most people realise is that with proper quality assurance in place and the possibility of roll-back, automated upgrades are the way to go. It works well with apps, and we've all become relaxed about seeing updates almost every day in many instances. That's what Microsoft wants for Windows, although some hardware makers just aren't interested in fielding questions that arise from these changes in their call centres.

With the advent of Windows 10 this problem could be amplified, because of two significant differences between it and those versions of Windows that came before it. One of these is that the Microsoft Store in Windows 10 can include Windows 32-bit desktop applications, which will be upgraded in the same automated fashion as universal apps. But (and this is the critical diversion) many updates to the OS under Windows 10 will be mandatory, because there won't be Windows 11; it will continually evolve from this point onwards.

The only users who get a pass on this are Enterprise SKU customers, and they don't get off completely; they're just allowed to delay some upgrades – and not indefinitely. In this instance the responsibility for controlling the deployment of upgrades is passed to the local system administrators, who can explain to their bosses why they held back a critical patch that then allowed hackers into their computers.

Given what's happened with both Lenovo and Samsung, the stage is now set for a battle of ideologies with Microsoft over where the PC goes from here. And as out of character it for me to say this, I'm with Microsoft on this one. **mm**

The Most Impressive PC Cases Money Can Buy



The NZXT Phantom 410 is a pretty cool looking case

We check out some extreme chassis for sale

PC cases have evolved drastically over the last 20 years or so, from the rather bland beige, toilet-coloured offerings of the past to the more elaborate and visually astounding things we see today.

For many, a case tells you as much about the owner as the hardware inside. A futuristic-looking chassis speaks of someone who likes to have the latest technology, for example. A case with multiple fans, vents and LEDs attached, meanwhile, suggests an extreme overclocker looking to impress others with their skills.

We're not trying to delve into the psychology of a PC owner, we're not that qualified, but it's apparent that PC cases are as important in a build these days as the technology inside.

With that in mind, we thought we'd take a look at a collection of the most visually impressive, stunning and outright weird cases that are currently available to buy. After all, it may inspire you to go forth and build one yourself, dremel in hand, or it might make you think twice about your next custom PC build.



The military-looking Corsair C70 is one to look out for

Corsair Vengeance C70

The Corsair Vengeance C70 is a case that would suit someone with as military background or those whose choice of gaming fun is, say, continual Call of Duty battles online.

It's an olive green mid-tower case that's designed to look like an ammo box, complete with hinged handles, clasp-covered side panels, rugged and riveted looks and a reset button that's under a flip plastic lid that resembles the launch button in a missile silo.

It's quite an extraordinary case and one with plenty of cooling options and room for some of the biggest cards and motherboards available.

How much does it cost, you ask. Well, surprisingly it's not that much. For a mere £89.99 on average, you can be the owner of this chassis. Be aware, though, you might get a few unwanted glances from the police if you were to carry this through the streets to a LAN gaming session.

Cooler Master HAF Stacker 935

Cooler Master has gone all out with this elaborate, expandable, stacking system PC case. In fact it's quite ground breaking.

The HAF (High Air Flow) case design isn't something new, but this stacker element has gone through a few design changes and as a result has been available for a good year or so now.

The Stacker is basically a mid-tower case with two extra ITX-sized cases that can be clipped on (or rather stacked, as the title suggests) to either the top or bottom of the main tower.

The main mid-tower section has many great benefits, such as ample room for liquid cooling solutions, a large motherboard and expansion cards, as well as countless other features. The further two attachment cases can be used to house more custom cooling solutions, as well as space and the mounting bays for up to nine 3.5" hard drives and an extra PSU in each.



The Cooler Master HAF Stacker system can be expanded to goodness knows how many configurations



The potential for a gaming supercomputer is tempting

There's plenty of mesh front air vents throughout each of the individual units, as well as dust filters and rubberised mounts for silent running and rubberised pass-throughs for cable management within and between each of the different cases.

You have several options available to you for stacking the cases. You can opt for the main tower with the pair of smaller ITX-cases on either end, like we mentioned a moment ago. Or, you could instead find more use for several of the ITX cases stacked on top of one another – perhaps as a hard drive cluster with combined liquid cooling throughout? We imagine there are other scenarios where multiple components can be stacked to work together, to form one all-powerful PC.

"Obviously drinks aren't allowed within half a mile of the case. Neither is the cat"

It's an impressive combination of units, with the smaller ITX-like cases costing in the region of £60 and the bigger mid-tower case costing around £129.

Lian Li PC-TU100

Lian Li has quite a catalogue of 'different' looking PC cases and chassis, one of which is the PC-TU100.

On the face of it, the PC-Tu100 looks more like one of those cases pop stars carry their make-up kits around in. However, the 120mm front fan, behind the aluminium mesh, is capable of keeping the contents of this mini-tower case cool enough for the user.

Not only is it quite stylish looking, but it's also portable with a large carry handle that folds up when not in use. The interior of the case too is functional and contains many clips and other stability extras to help make sure nothing is too disturbed if you do decide to carry your PC around with you.

There's not a huge amount of room inside; you'll easily fit a mini-ITX motherboard and a low-profile graphics card within its diminutive interior proportions, though, and maybe a couple of 2.5" SSDs. Amazingly, it's quite expensive for such a minimalist approach, regardless of the style and amount of brushed aluminium used throughout. The case can be had for around £85, with its younger sibling, the PC-TU200B costing nearly twice that amount for more or less the same style and setup.



We can't help thinking they look like make-up cases

NZXT Phantom 410

We recently had the pleasure of testing a gaming system that was housed inside an NZXT Phantom 410 case. It was brilliant white in this instance and from Computer orBIT inside the Orbit Indominus (see this week's group test).

This multifaceted mid-tower case looks pretty spectacular. The angled surface is neatly blended and the sudden triangular rise at the top of the case, which leads to a similarly angled windows, gives the impression that the Phantom would most likely be completely invisible to conventional radar systems.

Again there's plenty of room inside and support for multiple cooling solutions, be they liquid or air based. The Phantom 410 we had to test featured a row of many-coloured LEDs, with a remote, which when activated lit up the inside of the case with an amazing effect.

If you want something to turn heads (if you're a system builder, for example), then the NZXT Phantom is one to check out. You can pick one up for as little as £70 depending on where you shop.

Thermaltake Level 10 GT

We're beginning to stray into the world of the extreme with the Thermaltake Level 10 GT case. It was launched a couple of years ago, but it's still one of the most visually astounding chassis to appear on the market before designs start to become a little esoteric.

This is a monster full-tower case that comes in a box that Hafþór Júlíus 'Thor' Björnsson would probably struggle to lift. Once out of its box, though, the striking aesthetics of the front five protruding hot-swap drive bays, the grill black plastic optical bays and top front placed LED and fan control buttons are enough to make the extreme system builder's mouth water.

There's more mesh at the top-rear of the case, with a large single carry handle running down the complete length of one side. And a dominating features is a large protruding area that has a sliding mesh filter in place, behind which is a large 200mm LED fan that can either blow air directly onto the PCIe components or pull hot air out.

Moreover, there are other smaller extras, like a gaming headset hanger, rubberised cable pass-throughs, cable tidies, external PCIe screw mounts and countless other cool features.

Needless to say, the Thermaltake Level 10 GT looks pretty amazing, but for £180 on average it may be a little extreme for most users.

In Win H-Tower

Since we've already started to move into the extraordinary PC case design world, it's fair to say that one of the most highly regarded of these extreme cases is the In Win H-Tower.

On the face of it, the H-Tower already looks pretty amazing. The brushed steel effect case, which appears to be constructed in connected sections with an eerie glow of internal LEDs emitting from the joints, is like something from a sci-fi movie.



The ThermalTake Level 10 GT is as extreme as they get



The transforming In win H-tower is a marvel of technology



Even when it's stood normally. it looks impressive

However, at a touch of a button the In Win H-Tower goes well and truly beyond anything we've previously thought possible for a PC case: it transforms.

The case will fold away from a central point, pushing the lower panels out, the rear panel extending beyond, and the motherboard panel is raised from a vertical to a horizontal plane. Each of the panels are mounted on motorised arms that pull together or separate the parts, allowing the user to get to the interior of the case easily. The only thing it doesn't do is walk off and start a barrage of Michael Bay explosions.

There's plenty of room inside for large cards and other bigger hardware, as well as different kinds of cooling solutions – although you may need to be careful when fitting everything, as it could get damaged during the transformation. Incidentally, the transformation and LED colour effects can be controlled via a handy app, so all you need to do is tap away at your phone or tablet, and the case will respond accordingly.

It's a concept taken to the extreme, but in some ways it's really quite handy – although to be fair, we'll probably spend more time making it transform than actually doing any work with the hardware inside.

The In Win H-Tower will be available by the end of the month (according to Guru3D) and will likely cost in the region of £350.

AeroCool Strike X Air

Compared to the above H-Tower, the open case AeroCool Strike X Air looks positively normal. But if we were to stand it next to a more traditional case, then obviously its design would stand out.

As you can summarise from the title, this is an open frame PC case, allowing you access all the internal components easily and to keep things cooler than when enclosed.

Most open frame cases are used by the likes of overclockers, system testers and reviewers who require a quick and easy solution to fitting a new component without having to take a case apart whenever needed. In theory they work well, but it have a few problems with dust and the fact that open frame chassis are usually pretty ugly.

The AeroCool Strike X Air, though, isn't ugly. In fact, it looks quite amazing. There's the usual front port selection of mixed USB types, headphone ports, power and reset, but the dominant feature at the front is a large, hinged mesh lid behind which a 200mm fan resides. The mesh lid can flip up and allow you access to the horizontally mounted motherboard area. You can extend a jack and hold the mesh section so it's directly above the motherboard rather than angled down toward it.

The right-hand of the Stike X Air is where you'll mount the drives, and this section can be completely removed and slides out of the



The open-framed AeroCool Strike X Air case is a must for the system tester

frame to allow easier fitting. The cables are run from the drive section down to the PSU area that again is meshed at the base and has various holes and rubberised pass-throughs to the motherboard section for better cable management.

Obviously drinks aren't allowed within half a mile of the case, and neither is the cat. Dust is a pain, and if left without regular cleaning or stuffed under a desk on a carpet, then you'll get even more of a potential clogging issue than with a standard case.

It's designed to be bench or desk mounted, for testing purposes mainly. But as a showcase chassis, displaying the designed interior and components, it looks amazing.

The AeroCool Strike X Air is available now and costs in the region of £75 depending on where you shop.

Lian Li DK-Q1

We're back with Lian Li again, but this time with something a little different to its previous chassis.

The DK-Q1 is actually an all-in-one case and desk. It's one the company's smaller models, but the design is quite intriguing in that all the PC internals are housed within a pull-out drawer.

It's really quite simple. The drawer itself is pulled out, revealing a horizontal motherboard area complete with the necessary PCI expansion ports, fans, vents and cable management system. You populate the drawer with your PC hardware and hook up the usual



Lian Li has the case and desk covered with its DK-Q1

Worthy Mentions

These are a few cases that are available to buy through the normal channels, such as the advertisers within Micro Mart, Amazon and similar elsewhere. There are others, though, that are a little harder to get but are worthy of being mentioned.

Logisys Pre-Assembled Acrylic Case – A the name suggests, this is a pre-built, clear plastic case with multi-coloured LED fans. The finished product, when lit and kitted out, looks pretty fantastic. But you'll need to hunt one out, mainly from the US version of eBay.

Apevia X-Qpack2 – An ordinary Shuttle case but one with some flashes of jungle camouflage splashed across its exterior. Just don't lose it when you're playing in the jungle.

Chieftec BL-01B Bravo Series – A very odd looking case. It's an L-shape with a lower horizontal portion for the front case buttons and ports, a vertical section for the motherboard and a bit in between for fitting a monitor.

HSPC Tech Station – An open frame PC case, although not as aesthetically pleasing as the AeroCool Strike X. This is a basic frame with a large fan attached to one side. Interesting, but expensive from the US.

front power, LEDs and so on to an area toward the right of the front of the drawer. Here you'll find power, reset, HDD LEDs and numerous USB ports, there's even a key to lock the drawer in place so you don't accidentally pull it out if you were to stand up and walk away from the desk. There's even another slide-out tray for the keyboard and mouse under the drawer.

The top of the desk is made from a sheet of tempered glass, allowing you to place a monitor weighing up to 80kg on its surface. The glass pane can be removed for cleaning or to gain access to the inside without having to pull the drawer out.

It's an interesting idea, having your PC built directly into your desk. There's plenty of room inside the drawer for more elaborate cooling options, as well as multiple drive bays and even full-sized expansion and graphics cards. The vents at the rear appear to do a reasonably good job; there are a couple of 120mm fans at the rear, with a further three 120mm fans to one side where the drives and PSU will sit.

Although it's a decent enough idea, the cost might make you reconsider. For around £800 you could the be proud owner of a glass topped computer desk chassis. However, after spending that amount you might not have enough to actually fill it.

Conclusion

As you would expect, these are just a handful of examples we've come across. There are hundreds of more extreme, strange and ultimately weird PC cases available for those who require such things.

One thing we haven't looked at are case mods, since they generally tend to be one-offs rather than being built for sale and mass produced. A case mod can turn an ordinary PC case into something remarkable and totally out of this world. If you're not familiar with some of the fine examples we've had in Micro Mart in the past, then we recommend you do a quick search for some of the more outlandish examples.

Although these cases may look a little extreme, they do offer a better than average level of cooling, silent running and space for expansion. So rather than opting for a regular case come your next upgrade, how about splashing out a little more and going for a PC case that's a bit beyond the norm. **mm**

What Is A DDoS?

DDoS incidents have become more and more prevalent of late, so **Aaron** examines what they are and how they affect us

If you've got a computer or a games console, you'll probably be familiar with the term DDoS and know that it's often referred to as a hack and linked with the unavailability of various services. In the past, there have been numerous reports of groups of hackers launching DDoS attacks on specific companies, taking down services, inconveniencing users and causing the affected companies a lot of money. However, even with the term being more recognisable by the general public, the actual truth behind these attacks is often hidden or delivered in a misleading way. Let's correct this and examine what DDoS incidents really are, what they can do and if they can be stopped.

No Hacking Required

The term DDoS (often pronounced simply 'dos') stands for 'distributed denial of service' and is an attack that's launched on a company's network infrastructure with the goal of overloading it, thus bringing down whichever service is targeted. It's the kind of thing we've seen done in movies and TV for years, most of the time far from realistically, and in truth, it's not even a hack at all.

Contrary to popular belief and common representation in the press and on TV, a DDoS incident is not always the result of hackers; it doesn't even require any form of computing ability on behalf of the person or group launching it. Instead, a DDoS is often simply the result of paid-for services that can be obtained by everyone if they know where to look, which can be used to swamp servers with fake traffic requests. There's no scripting, bypassing of security or silly banter about the top five most used passwords in the world. No. There's a simple transaction to buy a service and, for whatever reason, the aim to cause havoc.

DoS and DDoS attacks shouldn't be confused. A simple DoS attack (denial of service) involves a single system and connection flooding a target with requests. A DDoS uses a whole network of systems and connections to do the same, with greater results.

Behind the scenes, there's an element of hacking, used to create the botnet that bombards the target, but we'll come to this later. The actual DDoS attack on the target, however, isn't an internal threat.

It's very important to understand this distinction and why DDoS incidents are not actual hacks. They're commonly reported in popular news in a very unrealistic manner, with such reports often classing them as hacks and painting a much more worrying picture than is actually true. These reports often cause people to panic, worrying that their data has been stolen or worse. While actual hacks can, indeed, involve this kind of intrusion and data theft and botnets can be used for other things as well as DDoS tasks, a DDoS does not represent the same threat. A DDoS isn't an actual intrusion and never becomes an internal threat. It's simply an external tidal wave of traffic that causes servers to fail and networks to come down. No data, personal or otherwise is accessed. Just as too much traffic can cause a motorway to come to a standstill, so too can too much server traffic, with the same gridlock effect, only with digital communication instead of vehicles in rush hour.

An actual hack involves hackers bypassing system security



➤ ***Many hacktivist groups employ DDoS attacks, but not all are actual hackers***

with various methods in order to access the internal network of an organisation – often databases that contain personal data. Hackers can then extract this data and do with it as they like. This is a real hack and the real threat we should be concerned with. DDoS attacks are nothing more than an annoyance to most of us, but for the companies they affect, they're almost as troublesome and dangerous as a real hack, as it always involves the loss of money from downed services and the cost of repair and customer compensation.



Both PlayStation Network and Xbox Live have suffered from DDoS attacks

Paid For Chaos

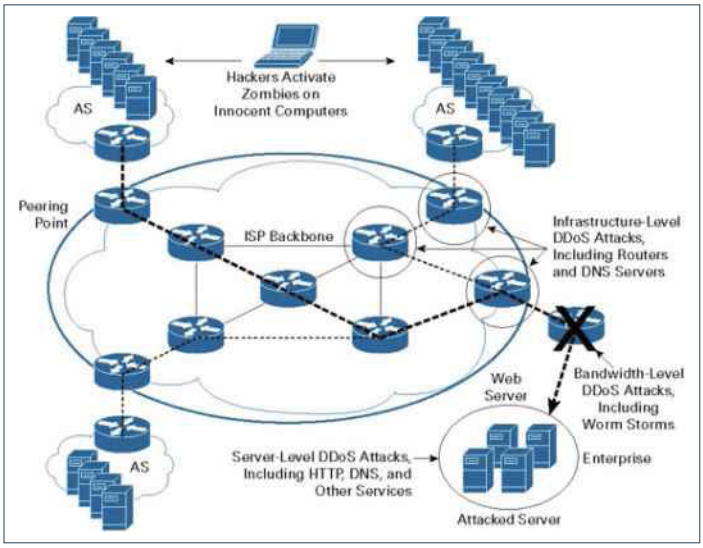
DDoS attacks aren't restricted to a select few, and their availability is surprisingly wide, with far more DDoS attack happening on a daily basis than you may think. That said, it's not like you can visit Amazon and buy a DDoS attack bundle. Of course not. For this you need to go to far more disreputable places, like the Russian black market and other nefarious online sources. According to research done by Trend Micro in 2012, it's relatively easy to find and purchase a DDoS service, with prices at the time of research ranging from $30-70 for a one-day DDoS attack, to $1,200 for a month-long outage. This isn't much for the kind of havoc such an attack can cause and only makes DDoS incidents more concerning potential threats. Those with an agenda, such as the various so-called hacker groups like the infamous Lizard Squad, could easily stump up the cash for this kind of service, and this has undoubtedly led to the growing trend of such incidents.

An analysis of global threats by Arbor Networks reports that there are over 2,000 DDoS attacks every day worldwide. These attacks can range from minor, low bandwidth hits to large-scale assault, and we rarely hear about these. When a big name, especially one that provides a highly visible public service, is attacked, though, we often hear about it (although not always). One of the most high-profile attacks in recent times was Lizard Squad's DDoS of Sony's PlayStation Network during Christmas 2014. This DDoS took down the PlayStation Network for several days over a period where many people had just got new PlayStation 4 units. It upset gamers and caused a lot of trouble for Sony, both financially and in terms of customer relations.

Every day, companies and networks all over are targeted for one reason or another, the truth of which will only be known to those ordering such an attack. Everything from big companies to smaller online gaming services can be a target, and all it takes is one disgruntled customer to pay the meagre price for a DDoS to be launched. Attacks are usually publicly reported when they're the result of a group or movement's actions, but they're also just as likely to come from a single person.

These attacks are so common that it's been revealed by various sources, including research done by Verisign, that one in three issues of downtime were the result of a DDoS attack





A diagram from Cisco showing how DDoS attacks affect a system

in 2014. Further, such attacks have increased by around 14% between Q3 and Q4 2014, and downtime can, on average, cost companies around $5,600 per minute or $300,000 per hour (from the research of Andrew Lerner of Gartner). One of the market's most affected by DDoS attacks in 2014 was the entertainment industry, which includes the aforementioned Sony and its PlayStation Network, Microsoft and Xbox Live, as well as a lot of PC titles like online MMOs and online gaming in general.

Some underground hacker marketplaces offer many specialised services, including week-long 'silence' attacks, which are geared towards taking a website down for a period. This is often used by people wishing to hurt a company or organisation by stopping it dead for several days. All that's needed is some cash (as cheap as $100-150) and a grudge or disagreement with a website.

This is pretty alarming stuff for company owners, and for the rest of us using these services, whatever they may be, it's also a concern or at the least irritating. This is even more so if you're paying a subscription or fee for a service and cannot access it.

DDoS In Detail

We know the effect they can have and how easy they are to put into action, but what exactly goes on within the digital domain? How does a DDoS actually work? Let's take a look.

DDoS attacks aren't simply a single type of attack. There are actually various different kinds of DDoS that can be used, each with various effects. Let's look at a few examples.

First we have the UDP flood attack. This is a DDoS that involves sending a huge number of UDP data packets to the target system. This isn't used all that often any more by serious DDoS attacks, as it's one of the older methods and one of the easier types to detect. As it uses UDP, it's not encrypted, which makes it easier to deal with. TCP flood attacks are similar to UDP, but utilise TCP packets in order to monopolise network resources.

Next we have the TCP SYN flood attack. Like other DDoS attacks, this sends large amounts of requests to a target, which causes the system to open up more resources to deal with the traffic. It also sends a response packet back to the source of the traffic, expecting a reply. This never comes, however, which adds up, takes up more and more resources, eventually causing the denial of service.

Smurf attacks are a common form of DDoS that involves sending ICMP (internet Control Message Protocol) ping requests to a target using fake broadcast addresses. These addresses are created by spoofing IPs, making the source and requests harder to trace and identify. ICMP flood attacks are the same as Smurf attacks, but don't utilise broadcasting.

There are also classes of attack (which the above methods fall into), each of which is specifically targeted. Application attacks are like DDoS scalpels, targeting specific applications or parts of programs. These are used to take down specific areas of a network and do so at a low traffic rate, making them harder to detect.

Fragmentation attacks send, unsurprisingly, fragmented TCP and UDP packages that make it difficult for the target system to read, causing obvious resource problems.

TCP connection attacks are launched to totally devour a connection's resources, including all connected firewalls, balancers and servers. These can bring down even the largest systems.

Volumetric attacks are all about causing congestion and tying up traffic within a network or in between the target and the internet.

All of these kinds of attack cannot be launched without the core aspect of any DDoS, and that's bots and botnets. This is where the actual hacking element of a DDoS comes in and is the part that most instigators who pay for a DDoS service are not involved with, hence the lack of actual hacking abilities in many so-called hacker groups.

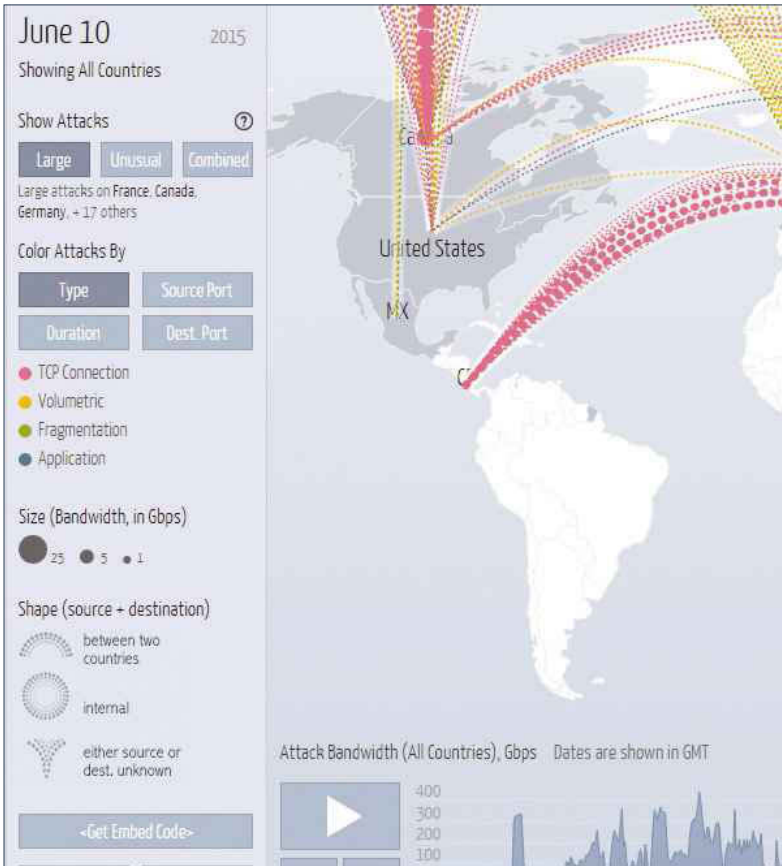
A botnet is a network of slaved or 'zombie' PCs that are used to generate and send the various requests to a target. To create a botnet, a hacker first has to gain entry to a system. Once this is done, a daemon is installed (an often hidden, background process) to turn the PC into a bot using a DDoS bot kit. This is repeated on several other machines, forming the botnet required to launch the DDoS attack. Following this, the DDoS can be launched by using a master program to control all the zombie systems to attack the target.

Target PCs that become zombies can be anywhere in the world and any type of system, often with the owner of the PC never even knowing their PC has been used to take part in such an attack. This is just one of many reasons why our PCs need to be secured.

➤ Arbor's worldwide DDoS attack map makes for interesting viewing, albeit a little worrying too

➤ Lizard Squad was responsible for one of the more recent, high-profile DDoS attacks





The aforementioned bot kits and software used to launch DDoS attacks, like the services themselves, are also up for sale on the black market. Anyone with basic knowledge of hacking and back-door access points into computers can attempt to launch their own DDoS. Again, as with the wide availability of DDoS services, this only serves to increase the growing threat. In fact, groups or individuals who want to use a botnet can purchase one, with prices in the range of $200 for 2,000 bots and $700 for a DDoS botnet. No technical knowledge required, because it's all done for them.

Unstoppable Force?

Knowing what DDoS attacks are, how they work and what they do, the question remains: can they be stopped?

Unlike other kinds of threat, such as viruses and actual hacks into a network's security, DDoS attacks are not actual security breaches, at least not for the target system. There's certainly a security concern for the systems used in the botnet, but the target is simply assaulted with heavy traffic and not breached. Because of this, there are no real security measures as such that can be put into place to prevent DDoS attacks. These attacks simply send requests, just like legitimate users, but on a large enough scale to bring down a system. They're designed to cause disruption and loss of income, rather than to steal data.

Still, there are ways for companies to help plan ahead and even prevent future problems. Traffic monitoring is one of the most important of these steps. All networks are monitored for traffic, as companies and their network management need to know they have the computing capacity and network bandwidth to cope with their normal day-to-day traffic. By ramping this up to a more detailed level and putting in place alarms to signify unusual amounts of traffic, companies may not be able to totally eliminate DDoS threats but can respond and deal with them in a much more timely manner. Indeed, it's dealing with attacks that's the most important and a company prepared for such matters will find it much easier, dealing with problems with less long-term cost. Failing to prepare and having no crisis plan of action in place means a DDoS will be much more severe.

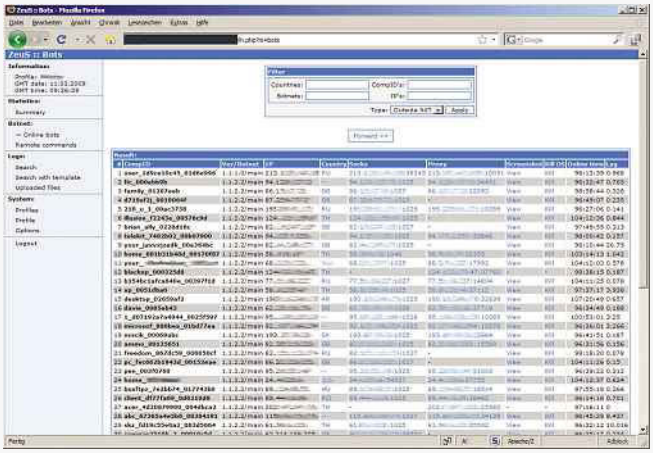
Attacks can target any aspect of a network or system. Firewalls can be overloaded, servers can be directly attacked, internet pipes can be hit, even SQL servers can be on the agenda – there's little aspect of a network that's free from attack. Knowing that any network, computer or website can be a target is a first step, and this leads to proper prevention.

Sadly, a lot of companies have yet to make this move, as evidenced by even a company as large as Sony suffering so badly last year, and this is why DDoS is such a threat. Until methods of prevention and adherence to best practices is commonplace, there's always going to be a larger DDoS threat than there needs to be. DDoS attacks may not be preventable, they're too easy and effective, but they can be dealt with more efficiently, and this is where the focus needs to be. **mm**

ZeuS

The botnet toolkit ZeuS is considered to be one of the most dangerous of this kind of hacking tool created. Using it, hackers have, in the past, created zombie networks that have stolen personal information, not just sent packets in order to DDoS systems. What makes ZeuS so dangerous is its ability to run on any system, regardless of the user privileges it has access to. It can access anything on a machine, even if the user logged on doesn't have access rights.

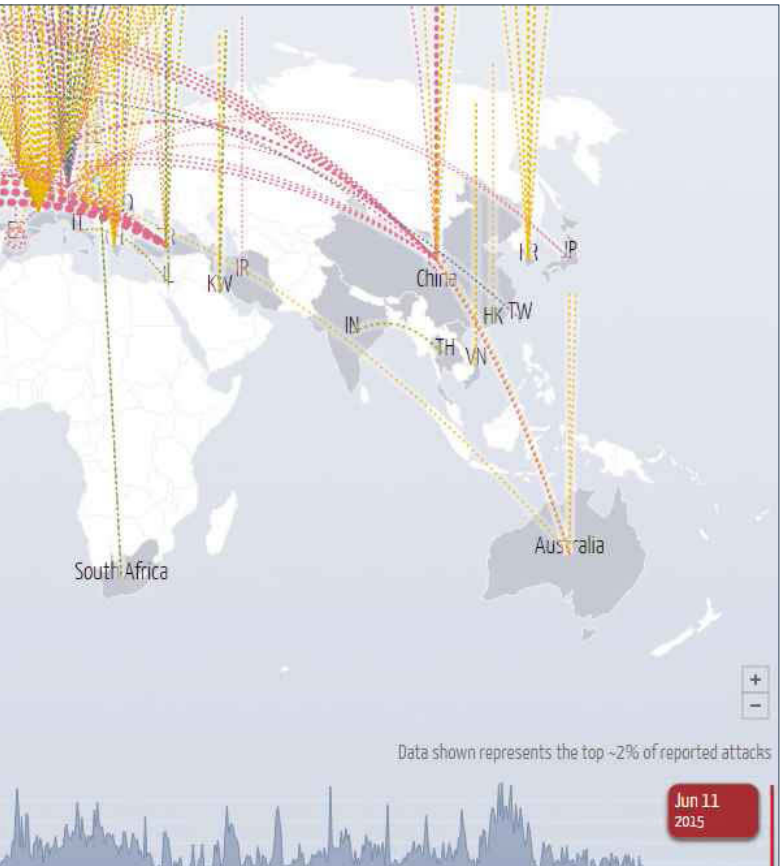
Black market prices for ZeuS packages range from $35-40 for installations in hosts, to $500 for the actual source code, and it's advertised all over the black market.



ZeuS is one of the most dangerous botnet packages around

Botnets are used to launch DDoS attacks, and there are many botnet packages around





Netgear Arlo

Michael hands over the protection of his home while he is away to Arlo

DETAILS
- **Price: £277.99 (as reviewed)**
- **Manufacturer: Netgear**
- **Website: www.arlo.com**
- **Required spec: Internet access**





While the name Arlo means 'Barberry free', the Arlo product offers to bring peace of mind in its role as a camera home security system. Developed by Netgear, the Arlo Smart Home Security Camera kit is available with different numbers of cameras plus other various items. This review is based on the two-camera package, which includes a base station, Ethernet cable, four magnetic mounts for attaching the cameras to walls and two sets of four lithium CR123 photo batteries. There's also claimed to be a quick start card but, in Netgear terminology, this turns out to be a URL from where you can download the relevant document.

The downloaded document leads you through the basic steps of attaching the base station to your router via the supplied cable, inserting the batteries into each camera and then syncing them to the base station. You'll need an Arlo account, which can be created by downloading the appropriate app for iOS, Android or Kindle devices. Setting up an account requires an email address and password. There's also an option to include a telephone in case technical support need to get in touch, but this feature refused to accept my landline number, so I left the box blank.

There are three account types covering various camera and base station combinations. An Elite account allows up to three base stations and 15 cameras, giving 100GB of 60-day cloud storage costing £9.99 monthly or £99 for an annual subscription. With support for ten cameras and one base station, a Premier account gives 10GB of 30-day cloud storage at a monthly cost of £6.49 or £64 annually. I've been using the free account that supports a single base station and five cameras with 1GB of seven-day cloud storage.

Each camera supports the full HD format of 1080p with fixed rate focus stretching from two feet to infinity, plus motion detection and night vision capability. Disappointingly, there's no noise detection feature, but you do get excellent image quality. When viewing content, whether of the live or recorded variety, you can pan and zoom into the image for a close look.

Content is automatically streamed to the base station and from there on to your cloud storage and/or smartphone. The base station comes with 16MB of flash memory and 64MG of RAM. Additional storage can be added using the two rear-mounted USB 2.0 ports.

The Arlo app offers a tabbed interface, allowing you to flip between Mode, Camera and Library views. By default you start with Camera showing the view from two cameras, which are identified by a 13-character string that can be replaced with a more appropriate designation such as front or back room. Individual rules can be set up for each camera as to how they should respond to events. Camera view shows icons indicating the status of the batteries (estimated at between four and six months), wi-fi signal and motion detection, plus the number of events recorded for that camera.

Library view gives you access to the recorded events organised by date and time. Clicking on a selected item will show you a playback of the event. Mode view allows you to create a schedule based on a wall chart set up to govern when the cameras are in operation monitoring the situation and sending you push notices regarding possible events. Some experimentation is required with scheduling to avoid being swamped by push alerts.

mm Michael Fereday

Easy home video security system for peace of mind





G Drive ev ATC 1TB

Mark dishes out the kind of abuse that only the G Drive ev ATC can take

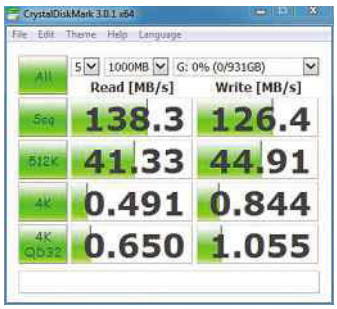
DETAILS
- **Price: £139.95**
- **Manufacturer: G-Technology**
- **Website: www.g-technology.com**
- **Required spec: USB 3.0 port on PC or Mac**



G-Technology is a division of HGST, the artist formerly known as Hitachi Global Storage Technologies, so that the fact it's making imaginative use of hard drives isn't much of a revelation.

The G Drive ev ATC is actually one of its existing products, the G Drive ev RaW USB hard drive nestling inside a new and super-abuse-resistant plastic 'ATC' casing. That's an abbreviation for 'All-Terrain Case', and it lives up to that title by protecting the 1TB disk inside from pressure, shock, dust and even immersion in water. What G-Technology doesn't say is how deep it will go, but seeing as the unit floats, hopefully that won't be an issue.

The other advantage of this casing is that it has its own integrated cable (USB 3.0 in this case), so you don't need to carry one with it. G-Technology does provide a separate one if you want to use the ev RAW outside the ATC case. Because of that, I'd suggest you leave it in the case, although that does make the drive much larger than normal.







One oddity that I experienced testing the drive was that initially it wasn't recognised by my PC. Eventually I worked out that G-Technology decided to format the drive by default for the Apple Mac, in an act of hubris that blew my mind.

Most Apple Macs would recognise a PC partition, but the PC (with 97.5% of the market share) has no idea what to do with the Mac OS partition.

For those with Apple Macs, you can get this exact drive with the Thunderbolt interface for an additional £40, although it won't go any quicker, in case you optimistically assumed it would. In my testing, the 1TB disk achieved 138.3 MB/s reads and 125.4 MB/s writes. That's well within the bandwidth limits of USB 3.0, so a Thunderbolt connected unit would equally limited by the raw physical drive performance.

The only means to actually leverage the bandwidth in either interface option is to use the firm's ev SSD product, which costs a numbing £424.80 for the 512GB model.

Those numbers hint at the critical point at which I stopped admiring the engineering skills and started counting the cost, because however you dress this up, this external drive is at least triple what you'd reasonably expect to pay for a 1TB external drive from another reputable brand. And in the real world, Transcend makes a 2TB drive rated with military-grade shock resistance that is nearly half this price.

It's also limiting that only the G Drive ev RaW drives will fit inside the ATC case, and G-Technology doesn't sell it separately for those who already own one.

While I like G-Technology's engineering and concept, it needs to really consider the bigger market that won't pay Apple pricing, no matter how nicely it's presented.

mm Mark Pickavance

A very expensive ruggedised external drive



Canon Maxify MB5350 A4 Inkjet Printer

The sunshine brings out an excellent printer deal from Canon

DETAILS
- **Price: £199.98 (Ebuyer)**
- **Manufacturer: Canon**
- **Website: www.canon.co.uk**
- **Required spec: Windows XP or later, Windows Server 2003 or later, Mac OS X v10.6.8 or later. Android and iOS through cloud printing**

Regular readers of my reviews in Micro Mart will probably know I'm not a huge fan of inkjet printers for business use. It's the most expensive way to produce printed documents, even if the initial outlay is low.

However, recently I've seen a subtle shift, where the printer makers are going that extra mile to reduce per print cost and make these devices singularly more attractive.

The Canon Maxify MB5350 A4 Inkjet Printer was originally launched about ten months ago, but I've decided to review it now because what was a good offer got even better recently.

But before I talk about costs, this is an excellent printer that could easily grace an office in a small business or even at home. As these things go, it has a relatively small footprint of just 46.3cm wide and 39.4cm deep.

However, when you actually load either of the two 250-sheet bins, they telescope out by 7cm, and with the paper output tray fully deployed it's another 15cm deeper.

Into this rather compact column, Canon has managed to squeeze a reasonably fast 600 x 1200dpi colour inkjet printer, a 1200dpi scanner, copying functions and regrettably a fax. No semaphore option is available at this time for those who prefer that historical means of communication.

The print system is Canon's own FINE technology, and thankfully it's gone with a cartridge system that separates all the colours, as per CYMK. Two-sided printing is available, and the scanner has a 50-sheet document feeder that can do a single-pass double-sided scan. Impressively, the scanning can be to email, a network folder, the cloud or even an inserted USB stick.



> **"The MB5350 has some of the largest physical cartridges that I've seen"**

As that statement suggests, the MB5350 is fully wi-fi networkable, and you can also attach it to a PC using USB or to wired network using Ethernet. When you consider that for some printers just adding Ethernet can cost half or more the price of this entire printer, that they just include all this functionality is great.

Normally, by this point in the review I'd have found fault, but the MB5350 almost defied my attempt to find any significant ones.

It's fast, achieving 23ipm mono A4 and 14ipm colour A4. That first page pumps out in under nine seconds, or a few seconds longer if in sleep mode. All the functions are easy to access through a 7.5cm colour touchscreen that prompts you through each process with an interface that's easy to follow.

With the printer originally costing around £250, and now

Specifications
- Productive all-in-one for a busy small office with print, copy, scan and fax functions,
- No waiting for documents with Quick First Print plus 15 colour pages/min and 23 mono pages/min,
- Wi-fi plus Ethernet connection: print from and scan to PCs, smartphones, tablets and cloud services.
- Integrated 50-sheet single pass 2-sided ADF and two 250-sheet paper cassettes.
- Print up to 2,500 mono and 1,500 colour pages with individually replaceable XL ink tanks.
- Create quality documents with dual resistant HD ink optimised for business printing.
- Recommended monthly page volume of 250-1,500 pages.
- Easy operation with large 7.5 cm colour touch display
- Free three-year warranty.
- A year's worth (5,000 sheets) of free paper







dropped to £50 on Ebuyer, the reasonable conclusion might be that Canon is about to sting you from another direction. But shockingly it's not, in this instance, because as inkjets go, the MB5350 has some of the largest physical cartridges that I've seen.

They're huge. And being so big they can, when Canon wants them too, hold plenty of ink.

The 'PGI-2500XL' variants of the cartridges each are rated for different numbers of pages at 5% coverage, but typically the black can produce 2,500, and the average yield on colour is 1,500 for each. The RRP cost of each cartridge is about £13, representing a cost per page of about 0.5p mono and 0.9p colour. However, you can buy a complete set of Canon-branded products for less than £40, with a little research. Those are great numbers and better than some laser printers I've reviewed.

And if that wasn't fantastic enough, Canon also has two promotional deals that make the MB5350 even better value still. The first of these is that it's offering a three-year free warranty, should anything go wrong with it. That's useful and probably worth about £40-50 if you covered it through a service. But it's also giving away 5,000 sheets of paper worth another £50 if you buy this printer and register for the promotion before 31st August 2015.

As value goes, I think you'd be hard pressed to beat this if you're in the market for a nice inkjet printer/scanner/copier/fax.

mm Mark Pickavance

EDITOR'S CHOICE micro mart

A powerful office inkjet with tempting promotional offers

micro mart
8 Quality
10 Value
9 Overall

BenQ treVolo

Michael has been organising his music listening with the help of a BenQ device

DETAILS
- Price: £229.00
- Manufacturer: BenQ
- Website: www.benq.com
- Required spec: n.a.





Adding to its range of products, BenQ has developed the enigmatically Bluetooth speaker named treVolo. This product comes with the claim of being the world's first portable electrostatic speaker. The electrostatic reference means the speaker driver can emit sound both forwards and backwards, with the emphasis on the mid- and high-range frequencies.

Along with its unusual name, the treVolo's appearance is not perhaps what you might expect from athis type of device. The unit has a wedged-shaped body with flip-out panels on either side that resemble wings when extended.

Five circular buttons arranged on the top of the device provide tasks that include volume up/down, mode selection, play/pause and phone call acceptance/rejection plus power on/off. Located on the rear of the device is another button meant to instigate a Bluetooth pairing process, but no matter how many times I tried, the result was the same: pairing mode failed to make an appearance. Checking with BenQ revealed there was a fault with my review sample, and I could achieve pairing mode by holding down the power button for several seconds. This alternate method proved successful.

For those audio devices that do not support Bluetooth, treVolo offers line in, line out and micro-USB options on the rear of the unit. Using these options I was able to feed audio to and through the treVolo. I was able to link MP3 players and a computer to deliver audio. I could also create a daisy-chain by adding my hi-fi system to the arrangement and listen to music from my smartphone and tablet being delivered through the treVolo to my hi-fi system. You will, however, need to provide the connecting leads, as BenQ only bundles a power lead with this product for use when charging the treVolo's internal battery, which was still delivering power after over 14 hours of playback.

Depending on your mood and choice of listening material, the treVolo can support three different listening experiences. These three modes are designated at Pure, Warm and Vivid, with each one identified by a coloured ring, which appears around the power button. The default Pure mode, with a green ring, sets out to deliver a natural sound with the flattest frequency response. A red ring indicates the Warm mode that is designated as the preferred option for rock, R&B or hip-hop with a bass boost. The third mode of Vivid is meant to add a boost to the upper mid-range and lower treble to enhance vocals and lead instrumentals. When this mode is active, the power button will be encircled with a blue light.

As you might suspect, you can cycle through the modes with the use of the mode button. There's also a free app that can be downloaded from the app or Google Play store that can carry out a similar task for mode switching. My ears were only able to detect a very slight difference between the individual modes.

With a smartphone paired with the treVolo, it can act as a speakerphone. You can accept or reject incoming calls and carry out conversations using the unit's built-in noise cancelling microphone. During calls, music output will be suspended and resume once the call is concluded.

All in all, it's a decent product, but there's still room for improvement.

mm **Michael Fereday**

With a few fixes and some leads, it could be a winner



Vodafone Smart Prime 6

Vodafone entices the young and mobile with cheap Lollipops

DETAILS
- **Price: £79 PAYG on Vodafone**
- **Manufacturer: Vodafone**
- **Website: shop.vodafone.co.uk/**



It seems like yesterday that I was getting excited about the Orange San Francisco delivering Gingerbread Android for less than £100. But these days, we expect so much more from PAYG phones, as well represented by the Vodafone Smart Prime 6.

This is a Vodafone locked handset that you can buy for less than £80, which has a feature set that a couple of years ago would have made it a premium device.

These include NFC, 4G LTE, a 5" 720p display, 8GB of storage (5GB usable), an 8MP camera with LED flash and a 1.2GHz Snapdragon 410 quad-core Qualcomm processor, and it even runs the latest Android 5.0 Lollipop.

The only real hindrance in that spec is the amount of internal memory, and that can be augmented up to 64GB with a micro-SD card. The slot for this, along with the SIM card slot, is hidden behind a thin plastic back.

You can't replace the battery regrettably, but in terms of construction quality, this phone seems like something I'd expect to pay £150 or possibly even more for.

The review phone came with Android Lollipop 5.0.2, where Google itself is on 5.1.1 on its Nexus devices by comparison. That said, this is one of the least problematic Lollipop builds I've seen, and the phone works smoothly with the wide selection of apps and games I tried.

The Smart Prime 6 therefore ends up as one of those products that I find faults in that aren't substantial, but which might annoy those who unrealistically expect a phone that costs this small amount to be completely perfect.

My first minor gripe is the side buttons along the right-hand edge, with the sound rocker at the top and the power button below. This appears to be exactly the opposite arrangement to most phones, so be prepared to adjust.

The screen isn't bad and it's reasonably bright, but it just comes over as a tiny bit soft for whatever reason. Once you've seen the latest Samsung or HTC displays, it's impossible to erase those expectations, but what Vodafone used is fine, really.

If I have a genuine complaint, it's all the Vodafone apps that are pre-loaded on, the majority of which I'd ditch immediately. What's really annoying about these is that they're not controlled through the Play store, so removing them requires knowledge of the Apps section of Settings.

This might seem churlish of me, as Vodafone is almost certainly subsidising this device, but customers will be paying for its service and most of what is loaded in addition to Google's standard set won't see much use.

Forgetting branding excesses, this is a decent phone with better than average battery life and a big enough screen to watch TV on at a pinch. The camera isn't anything special when there isn't good natural light, but it was better than I was realistically expecting.

The only real question here is the commitment to Vodafone's phone service. For existing customers that's not an issue, but others will need to balance that against what they use now, even if the Smart Prime 6 offers exceptional value for money.

mm **Mark Pickavance**

A very useable Lollipop phone for Vodafone PAYG use



Dustbowl

As the dust settles, a post-apocalyptic world emerges. Can you survive?

DETAILS
- **Price: £5.99**
- **Manufacturer: The Pompous Pixel**
- **Website: goo.gl/QA4Inn**
- **Required spec: Windows XP or later, 1.8GHz CPU, 64MB RAM**

There are some wonderfully creative and inspirational indie titles available on Steam at the moment. We seem to have entered an 80s-like golden era of the lone developer or small team releasing something that could easily blow a triple-A title out of the water. It's something we and a lot of other gamers can appreciate and thoroughly enjoy.

Dustbowl is one such title. Released mid-May, this retro inspired adventure/RPG has the look and feel of C64 or 16-bit game, but with elements of a classic DOS title thrown in. The story see you as the son of a survivor of an alien attack. In the aftermath, the world is broken and damaged, with what's left of humanity scraping a rough living in an underground shelter to avoid exposure to the poisoned surface above.

Your task appears simple enough: to find your father who has ventured into the Dustbowl to find the source of mysterious earthquakes before they wipe out what's left of your shelter. However, once you begin to delve into the world you now inhabit, you soon realise there's a lot more going on under the surface.

Visually, *Dustbowl* has a magnificent Zak McKracken look to it. There's more, though, as the developer has included a basic crafting system alongside a clever turn-based combat engine that involves you having to react in time to get a hit – or miss, if you're not on the ball.

There's also a survival element here too, in that you need to keep fed and watered and to protect yourself from the ravages of the environment – not to mention the other scavengers, gangs, mutations and creatures you'll no doubt come across.



Crafting is simple, but effective



The combat system works well, and adds a unique element to the game

> **"It will require all your RPG and adventure skills to survive"**

There's a lot of enjoyment to be had from playing *Dustbowl*. Those who like their adventures raw, cunning and a little challenging at times will certainly relish what it has to offer. The post-apocalyptic world it's set in is harsh, unforgiving, and it will require all your RPG and adventure skills to survive for more than a couple days, let alone leaving the relative safety of the bunker and striking out into what's left of the surface.

There are a few improvements that could be worked on – a better mapping system perhaps and some tweaks to the dialogue. But on the whole it's a sterling effort, and the odd encounter with a mole-man and his pet, mutants and even the Tardis makes up for any problems you may come across when playing.

For a mere £5.99, *Dustbowl* is a great effort and one worth investing in. There are tons of quests, side missions and secrets to uncover, as well as amusing Easter eggs. The survival element, combat and crafting are enjoyable, as well as being easy and effective enough to keep you playing through the adventure.

mm David Hayward

A cracking indie adventure/RPG title



TokyoFlash Kisai Link

If you hate missing phone calls, this could be just what you need

DETAILS
- **Price: £51.05**
- **Manufacturer: TokyoFlash Japan**
- **Website: goo.gl/xwr3Wd**
- **Required: An iPhone, a wrist**



Sometimes, I really miss my old Nokia phones. Unlike the fancy smartphones I have today, when they vibrated or rang, you were sure to feel or hear them. These days, missed calls and messages are a near certainty if I'm out and about, because when my phone (a Samsung S5) is in my pocket, its weedy speaker and vibration function simply don't do enough to get my attention.

When smartwatches came along, the answer looked like it might have arrived. But having given it some thought, I realised that they were too expensive, especially considering all I want is something that will vibrate on my wrist.

And that's where the TokyoFlash Kisai Link range comes in. The version I reviewed was the Link Midnight, which comes with a black, real leather strap. However, it's just one of many different designs, with others versions coming with beads or friendship bracelet-style designs.

What they all have in common, though, is that they include a small Bluetooth module (around 2 x 4cm), which sits against the wrist and vibrates when you receive a phone call, SMS or email. It also seems to work with other apps too - vibrating in response to Skype calls and messages, for example.





Of course, there's a chance you might miss the vibration on your wrist, so the TokyoFlash also put notification LEDs on one side of the Link to show you if you have a missed call, message or email. These will continue to flash until you take out your phone and look at what they are.

The combination of the LEDs and the vibration work effectively, and the process of pairing the Link with necessary Kisai Bridge app is straightforward. This app, oddly enough, doesn't look nearly as good as TokyoFlash's actual products, but it does its job well, allowing you to enable or disable features of the Link. Among these are the proximity alert, which causes the Link to vibrate if you stray too far from your phone, plus you can toggle features like the LEDs, the vibration and which type of alerts you'll be notified of.

Another handy feature is the phone finder. By pressing and holding the function button (which is also used for pairing the Link with the app) for five seconds, you can make your phone vibrate and emit a ringtone. Sadly, it can't make your phone ring or vibrate if those functions are turned off, but it's a useful extra nonetheless.

What's more of a problem is that none of this will work if you don't own an iPhone (I had to borrow one for testing), because the Kisai Bridge app is iOS only at the moment. This is massively disappointing, because the Kisai Link is a great product and deserves a much bigger audience. Still, it wouldn't take much for TokyoFlash to put together an Android app, so hopefully that's something we can look forward to in future.

The other thing that needs to be addressed here is the price. Although you can get a $4 (£2.58) discount by Liking the Kisai Link on Facebook, the shipping costs £12.92 (unless you spend over £77.75, in which case it's free), making the Link at least £61.39, which is far from cheap. However, if you want a simple but effective and undoubtedly stylish notification system for your wrist but you don't want to go as far as to buy a smartwatch, then it has everything you need – as long as you're lucky enough to own the right kind of phone to use it with.

mm Anthony Enticknap

A simple but effective way to stop missing calls



GROUP TEST

£1,000 Gaming PCs

For this special group test we asked eight suppliers to come up with a complete gaming system for £1,000. How they managed it we'll never know, but they did ,and David Hayward is somewhere in a forest of cardboard boxes trying to see which will come out on top

Box.co.uk Cube 703 Gaming Package

DETAILS
- **Price: £999.99**
- **Manufacturer: Box.co.uk**
- **Website: goo.gl/OPr5kf**
- **Warranty: Two years RTB**

The £1,000 gaming machine sent over from Box.co.uk is a singularly impressive setup, to say the least. The Cube 703 Gaming Package consists of a Cube 703 watercooled base unit, a BenQ RL2455HM gaming monitor, CMStorm Cooler Master Octane keyboard and mouse set, an In Win BatMat mousepad, In Win iEAR headset holder and an exclusive gaming bundle, which features *Batman: Arkham Knight* and the Intel Software Stater Pack offer containing games and apps.

There's certainly a lot going on in this bundle; starting with the base unit, the Cube 703 is an In Win 703 mid-tower chassis, an imposing vision in red and black. Inside you'll find an MSI Z97 Gaming 5 board, onto which Box has installed an Intel i5-4690K processor running at 3.5GHz. There's 8GB of DDR3 2400MHz memory, a HyperX 3K 120GB SSD with a copy of Windows 8.1 64-bit pre-installed and a 1TB Seagate SSHD as a secondary drive.

Graphics are handled by the ever capable MSI Nvidia GTX960 2GB card, which when combined with the above produces a 3DMark 11 score of 9627 – meaning it'll happily play any game currently available with everything turned on.

The system build is very impressive indeed. The case arrives with plenty of external and internal packaging to protect the components in transit, and there are ample warning stickers to inform you to remove said packing before powering on. The addition of a Cooler Master Seidon 120V R2 liquid cooling kit is a great idea, and as a result the system runs exceptionally coolly and quietly. Plus we get a nice red lighting effect with the LED fan.

The case is finished off with a Cooler Master V650 semi-modular, 80-Plus Gold PSU, fitted at the bottom of the case with underside vents in the chassis and raised considerably above the floor with the large rubber feet.

The monitor is also a good choice from Box. We've had a few BenQ examples in lately, and each has proved to be equal to the likes of the top-of-the range AOC and Philips models. In fact, we reviewed the 27" version of the RL2455HM a few months ago and were pleased with what we saw.



In terms of software, Box includes over £150 worth of games and other titles such as Corel PainShop Pro X7. The Intel starter pack is good enough for most users and younger people, and *Batman Arkham Knight* will surely appeal to the older gamer.

We've not come across the In Win Batmat before, and as you can probably guess it's a Batman-themed gaming mousepad designed to effortlessly help your mouse glide across the desktop. It's actually quite good; we were surprised by how much desktop space it offered and how well it performed.

The final piece of the bundle comes in the form of the Box two-year warranty, with one-year collect and return and the second year return to base as standard.

Overall, we were immensely impressed with what Box.co.uk had to offer. The Cube 703 Gaming Package is fast, stable, expertly built and contains enough extras to convince even the most sceptical of customers to part with their money.

A fine example of a gaming setup. Box.co.uk has set a high bar to beat, especially considering you get all of the above for £999.99.



It's quite an impressive gaming package from Box.co.uk

Falcon Computers

micro mart
9 Quality
8 Value
9 Overall

DETAILS
- **Price: £999.99**
- **Manufacturer: Falcon computers**
- **Website: goo.gl/m657ZW**
- **Warranty: Two years collect & return**



The system from Falcon Computers is superbly presented and detailed



It's also the fastest PC in the group, with plenty of extras too

Falcon Computers is another company that has always impressed us with its build quality, service and the choice of components it uses for each of its systems. We were looking forward, then, to seeing what the team at Falcon had sent us. We weren't disappointed.

Falcon has built its system with a Zalman Z9U3 gaming case, a formidable looking base unit with blue LEDs emitting an eerie glow front, back and from within. There's also a handy system temp digital readout on the front of the case, along with fan speed thumbwheel. The monitor used here is an AOC E2460SH 24" 1ms LED TFT, a wise choice for a gaming system.

The motherboard is an ASRock Z97 Anniversary Edition, on which there's an Intel Core i5-4690k quad-core processor running at a stable overclock of 4.5GHz (a service that normally costs £30) and cooled with a ThermalTake Water 3.0 Performer all-in-one liquid cooler. There's 8GB of HyperX Fury 1600MHz memory, a secondary 1TB Seagate hard drive with 64MB cache and a 120GB Samsung EVO 850 SSD, with a copy of Windows 8.1 64-bit.

As for graphics, there's a Zotac GeForce GTX970 with 4GB of memory, together with a free code for *Batman: Arkham Knight*. And to top it all off, Falcon has included a Cooler Master CM Storm Devastor gaming keyboard and mouse kit.

The warranty is just as good as the hardware, with two years on-site collect and return, one year's parts and three years' labour. All in all, it's an immensely impressive setup and available for £999.99. And there's also free delivery to the UK mainland.

There are some interesting choices used with this build. For one there's the i5-4690K. It's the gamer's favourite at the moment and represents the best performance for money before you begin to hit higher-end Core i7 chips. Then there's the choice of graphics card: the GTX970 4GB is a bit of a gaming monster and is more than capable of running the latest games with very high or ultra settings. The AOC E2460SH, as we mentioned, is a perfect gaming companion and is one we've reviewed in the past and found to be an excellent performer.

In terms of benchmarking, the combined processing power of the above system managed to score an eye-watering 12324 in 3DMark11 – a number that shows it's more than capable of playing anything as well as being well above the recommended top spec for Oculus Rift gaming when the kit is finally made available.

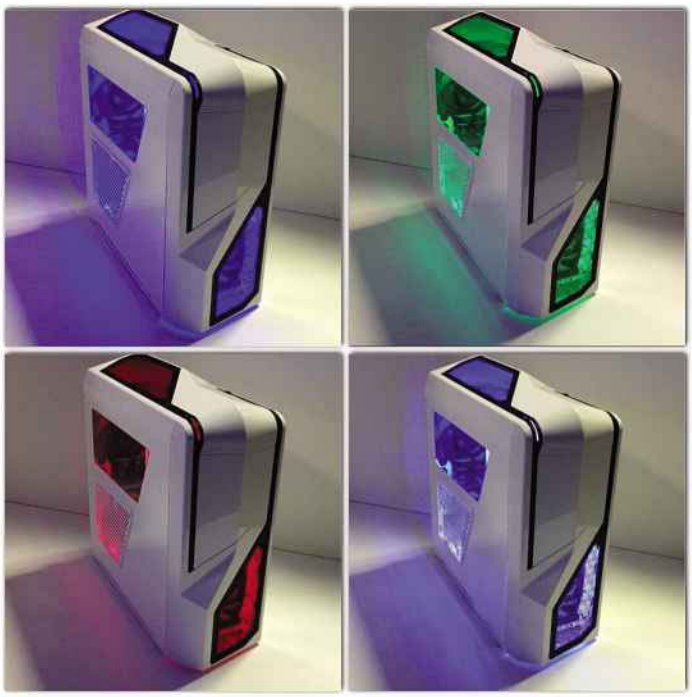
The Falcon Computers system is quiet and remarkably powerful. The Thermaltake liquid cooling solution allows for a higher degree of overclocking when combined with the i5-4960K, and there's a large 120mm LED fan located at the front and at the top of the case to help keep the drive bay and RAM cool. It's also worth noting that the FSP 600W 80+ uses a quieter than normal PSU fan.

Of course, high benchmark numbers don't mean anything unless the system is well designed and expertly built. Thankfully, the Falcon Computers entry is just that. The team have done an exceptional job, and as we were with the Box PC, we're still amazed how everything in the package comes to just under a thousand pounds.

In short, if you're looking to purchase a gaming PC or any other PC for that matter, then a Falcon Computers machine is as near perfect as you could ask for.

Computer orBIT: Orbit Indominus

DETAILS
- Price: £999
- Manufacturer: Computer orBIT
- Website: goo.gl/rOvZrm
- Warranty: Two to three years RTB



The Orbit Indominus is another superb system, with a great case



The level of design and detail with multi-coloured LEDs looks impressive

micro mart
Quality 8
Value 8
Overall 8

We haven't used Computer orBIT before, so it's with great interest that we plunge into the gaming package it sent over to us.

It's something a little different from the previous two systems we've tested, in that the Orbit Indominus (outstanding name, by the way) features an AMD chip instead of the Intel examples we've seen so far. The Indominus consists of an NZXT Phantom 410 – a brilliant white, multifaceted mid-tower case, complete with a row of multi-coloured LEDs around the inner rim and extremely flashy Indominus badged vinyl decals on the side panel. Tearing our eyes away from the case, there's also an AOC E2460SH 24" gaming monitor and a Cooler Master CMStorm Devastator keyboard and mouse.

The motherboard used is a Gigabyte 990XA-UD3 with a liquid-cooled AMD FX8320 eight-core CPU overclocked to 4.2GHz and a generous 16GB of 1866MHz DDR3 HyperX memory. There's a secondary 1TB Seagate Barracuda hard drive installed, along with a 120GB Samsung Evo 850 SSD and Windows 8.1 64-bit.

Graphics come courtesy of an MSI GTX970 Overclock Edition with 4GB of memory, and there's also an installed TP-Link PCIe wi-fi card with a pair of antennas. Finally, the Indominus boasts a 650W Super Flower 80+ Gold-rated modular PSU, with further power cables to a variety of different ends in a custom Super Flower bag.

The system performs very well indeed, scoring 11290 in 3DMark11. That's more than enough to see you through the next gaming generation and is roughly equal to the specifications laid out for worry-free VR gaming.

The monitor, keyboard and mouse are the same as the previous Falcon system and a good choice for the gamer. Using an AMD processor is a brave decision, since AMD seems to have fallen from grace for a lot of gamers recently, with the i5-4690K being the darling of the gaming world at the moment. It's a decision that works well, though, and when combined with the choice of motherboard, RAM and the included Cooler Master Seidon 120V liquid cooling unit, the result is a worthy gaming system indeed that has a high build quality.

The multi-coloured LED arrangement might seem a little excessive, but it looked pretty good when stood in a line-up of the cases here. Computer orBIT has even supplied a remote for the LEDs, allowing them to change colour, flash, pulse and so on.

One more thing worth mentioning: the Orbit Indominus has more than ample case cooling. There's the large fan on the Seidon 120V, a 140mm fan at the front of the case and an NZXT 240mm dual (2x 120mm) fan bracket placed at the top of the case. Remarkably, and despite the amount of air-cooling, the Indominus is exceptionally quiet.

We're quite impressed with the Computer orBIT entry. The Orbit Indominus has the flashy looks of a gaming system, as well as the hardware and processing power to back up those looks. For £999, with two years' RTB warranty as well as unlimited phone and email support, this is certainly a system worth checking out.

Eclipse Computers: Eclipse Titan

DETAILS
- Price: £999.95
- Manufacturer: Eclipse Computers
- Website: goo.gl/9hiEAU
- Warranty: Three years

The review system sent through from Eclipse computers features an In Win GT1 ATX gaming case, HKC 2615 26" LED monitor and the now familiar Cooler Master CM Devastator gaming keyboard and mouse kit.

The In Win GT1 case may lack the looks of the previous examples we've seen, but inside there's a decent enough setup. The motherboard used here is an Asus Z97-P with the ever faithful Intel i5-4690K running at the stock 3.5GHz and another system with a generous 16GB of HyperX Fury memory.

The storage on the Eclipse Titan is especially good, with a secondary 2TB Seagate Barracuda hard drive and an ample 240GB Kingston HyperX Fury SSD, on which there's a copy of Windows 8.1 64-bit installed.

Graphics are handled by a Palit GeForce GTX970 with 4GB of memory, which when combined with the processor and memory in the Eclipse Titan manages a welcome score of 12006 in 3DMark11. It's a good score, below the Falcon system, but just ahead of the Computer orBIT machine.

Interestingly, this is the first traditionally air-cooled PC we've had in the group. The Zalman CNPS11X CPU cooler is a monster of a unit and does creep over to the RAM slots to the point where there are mere millimetres between the closest RAM stick and the bottom of the cooler. However, it does a good enough job of keeping the CPU cool, although overclocking to 4.5GHz and more may be unwise without the better performance of a liquid cooler.



The Eclipse Titan is a good gaming system, but we'd prefer a better GPU than the Palit example used for this style of case



A nice big monitor is just one of the many positives

A slight issue we had with the Eclipse Titan was the fact that the Palit GTX970's Type C Mini-HDMI port is so close to the fitting for the backplate it was impossible to actually plug our mini-HDMI cable in. We ended up using an adapter for the more accessible DVI port. It's just the design of the base unit and the positioning of the ports on the card that are at fault here, not so much Eclipse.

The air cooling of the system is further enhanced with a large 140mm LED fan at the rear of the case. It does a perfectly acceptable job of keeping the inside of the system cool, and thanks to a good build from Eclipse there's plenty of airflow. It does, however, increase the noise of the system significantly, when compared to the liquid-cooled solutions. Thankfully, you can quieten the system fan by flicking the Silence/Turbo button located on the front of the case.

The Eclipse Titan is a great system, and we especially liked the added storage from the 2TB spinner and 240GB SSD. If this review seems negative that's only because we've been spoiled with watercooling solutions and fancy-looking cases. It's easy to forget that a good gaming system needn't look like something from the future.

A good positive point to finish on is the HKC 2615 monitor, a clear and well balanced monitor for both video and gaming. And the fact that it's a couple more inches extra than anything we've had previously certainly helps.

Eclipse Computer's Titan gaming system costs a reasonable £999.95 and comes with a three-year warranty with the first year parts and labour.



PC Specialist

DETAILS
- Price: £999
- Manufacturer: PC Specialist
- Website: goo.gl/ntgd0l
- Warranty: Three years



▲ *A highly overclocked but stable system from PC Specialist*



▲ *A good choice of components throughout. Even the Palit card worked well with this case*

Long-time gaming PC supplier PC Specialist sent us one of its gaming bundles, consisting of a Corsair Spec-03 gaming case (with red LEDs fitted to the large front 120mm fan), an AOC E2470Swda 24" monitor and a Cooler Master CM Devastator keyboard and mouse set.

Inside the ample case you'll find an Asus Z97-E motherboard with an Intel Core i5-4690K overclocked to 4.6GHz, which is cooled by a Corsair H60 liquid cooling kit. There's a single 8GB HyperX Fury 1600MHz RAM stick in place, and for storage PC Specialist has opted for a 1TB Seagate hard drive with an additional 250GB Samsung EVO SSD with Windows 8.1 preinstalled.

Graphics come courtesy of the same Palit GeForce GTX970 4GB that we saw in the system from Eclipse Computers. This time, it's worth noting, due to the arrangement of the backplate on the Corsair case, the Type C mini-HDMI port was more accessible. Oddly, PC Specialist didn't include an adapter for the mini-HDMI port. We used our own cable for the review, but perhaps it's worth asking for one to be thrown in prior to purchasing.

The PC scored a decent 11491 on 3DMark11, putting it slightly above the Orbit Imominus's score and just below that of the Eclipse Titan. Needless to say, it's more than a match for the free *Batman: Arkham Knight* game that comes with the package.

> **"Thanks to the liquid cooling, the ambient system noise is extremely low"**

The monitor is a slight detour from what we've seen so far. Rather than going down the AOC E2460SH route as a couple of other system builders have, PC Specialist has opted for the more rounded E2470Swda. It's certainly a good enough monitor, but the E2460SH may have the edge when it comes to gaming response times and clarity.

The inclusion of the 250GB Samsung EVO SSD is certainly welcome. There's a good compromise in this system with the extra 1TB spinner, to help cut a few pounds off the asking price while still offering a good amount of space. The extra money spent on the larger SSD is a good idea, though, as we already saw with the system from Eclipse Computers.

Thanks to the Corsair H60 liquid cooling CPU kit, the ambient system noise is extremely low. Even the front mounted fan is very quiet, while at full speed too. There's also plenty of room for a top-mounted cooling kit as well, should you require a bit more air flow. It's a bit risky clocking the i5-4690K to 4.6GHz, but PC Specialist has managed to keep the system stable.

Speaking of room, the Corsair CS 650W 80+ PSU is low profile enough to allow for extra expansion cards to be fitted without having to restrict the internal air flow. PC Specialist has even included an SLI bridge connector in case you include another graphics card at a later date.

PC Specialist has put together a good, all-round gaming system here with a three-year warranty – one month collect and return, one year's parts and three years' labour. It's capable of lasting you for quite some time to come, all the while offering the highest to ultra settings in-game. And it's easily upgradable without having to spend out for a new case or motherboard.



Epsilon Computers

DETAILS
- Price: £999.99
- Manufacturer: Epsilon Computers
- Website: goo.gl/jPnzvM
- Warranty: One year

London-based Epsilon Computers sent in its Red Star Computer Build Package, which turned out to be a package with some interesting extras.

The setup consists of a Corsair Carbide 100R mid-tower case, with windowed side panel and red LED front and rear fans; an Asus VS229NA 22" monitor; a Corsair Raptor K30 gaming keyboard; Corsair Raptor M45 gaming mouse; a Corsair Raptor LH1 Evo gaming headset, and finally a Corsair MM200 gaming mouse mat.

Inside the Corsair Carbide, Epsilon has installed an Asus Z97-K motherboard with an air cooled (using an Arctic Cooling Freezer 13) Core i5-4660 processor at 3.2GHz. There's a pair of 4GB Corsair Vengeance RAM sticks, a Seagate 1TB hard drive and a MushKin Chronos 120GB SSD on which a copy of Windows 8.1 64-bit edition has already been installed.

For another twist in the build setup, Epsilon is the first supplier to fit an AMD graphics card for the group. In this case it's a Sapphire Radeon R9 380, Nitro Dual-X OC edition, with 4GB of memory. The benchmark result from 3DMark11 scored a decent 9353, which may well be the lowest score we've so far, but it's still better than 70% of all other benchmarked results and will happily play any modern game with high graphical settings. All this is powered by a Corsair 500W CX500 PSU, which is good enough for the system in use. However it may seem a little underpowered for those who are planning to upgrade sooner rather than later – or add a second graphics card or other power hungry components.



The Corsair Carbide 100R is a decent enough case for any gamer



The Asus monitor and Corsair gaming kit are also high points

The use of the Asus VS229NA is a good choice, the wide viewing angle and good overall clarity making this a more than adequate gaming monitor, as well as for normal day-to-day duties. The inclusion of the Corsair gaming kit: keyboard, mouse and headset, is an ideal addition for any gaming package. The K30 keyboard, although non-mechanical, is one of the better rubber domed and fully illuminated gaming boards around. The same can be said for the M45 mouse – although we always found the M45 to feel a little too light for our personal tastes. Either way, it's a refreshing change from the Cooler Master Devastator kit that comes with many of the other PCs here.

The build quality of the Epsilon Computer package is very good. There's plenty of room inside the case future upgrades, and the air cooling setup does an excellent job while remaining whisper quiet. It's a good setup and focuses on the gaming peripherals rather than the luxury of owning a more elaborate gaming and aesthetically impressive case.

The final cost of the Epsilon Computers Red Star Computer Build Package comes to £999.99, which also includes a year of AVG Internet Security and a one-year return-to-base warranty. Plus Epsilon has agreed to free delivery for the system, which may sweeten the deal a little.



Chillblast

DETAILS
- Price: £999.99
- Manufacturer: Chillblast
- Website: goo.gl/4HqjX8
- Warranty: Five years

Chillblast is a regular favourite among the gaming community, and as it happens, the company decided to send us through a package with a few interesting choices thrown into the mix.

The Chillblast gaming package includes a Zalman Z11 Neo mid-tower case, a new chassis on the market and one that comes complete with plenty of upgrade potential for cooling, drives and full-sized graphics – along with cool blue LED lighting for the front and top 120mm fans.

The monitor is an AOC E2460SH, the same that we've already seen with the likes of the Falcon Computers system, and finally Chillblast has decided on packaging an I-Rocks K10 gaming keyboard and I-Rocks M09 gaming mouse. Both of these were recently reviewed separately in Micro Mart and were found to be excellent choices for gamers.

The motherboard used here is a Gigabyte Z97-HD3, on which there's the familiar i5-4690K, which Chillblast have overclocked to a stable 4.2GHz. There's 8GB of memory and, interestingly, a single 1TB Seagate SSHD, which moves the most used data to its 8GB solid-state cache.

The graphics card is a Zotac GTX970 with 4GB of memory. The accumulated 3DMark11 benchmark for this little lot comes to an impressive 11606, which puts the Chillblast PC – in terms of benchmark performance – in third place after the Falcon Computers system and the Eclipse Titan.



The Chillblast Zalman Z11 Neo is a great choice for a gaming case



All other components and peripherals used are top quality, and a five-year warranty can't be ignored

The i5-4690K is cooled by an Akasa Nero 3, a monster of a CPU cooler that's more than capable of keeping an overlocked CPU under control without it breaking into a digital sweat. It's also incredibly silent, and even when under considerable stress, along with the case fans, the entire system is as quiet as any we've used with a liquid cooler installed.

We've already seen how good the AOC E2460SH is as a gaming monitor. The fast response time, great colours and clarity speak for themselves. The inclusion of the I-Rocks keyboard and mouse are a pleasant addition. They may not have all the bells and whistles of a more elaborate gaming keyboard/mouse setup, but they're more than capable of going toe to toe with the best membrane-based devices, and they're great value for money.

The Chillblast system is an extremely neat build and well designed to allow the best airflow through the case,. while still offering room for future system enhancements. The Aerocool 600W 80+ Bronze PSU is slim enough to be out of the way and more than capable of providing power to better graphics cards or lesser-powered SLI/CrossFire setups. We particularly liked the design of the Zalman Z11 Neo, with the large air-flow slats dominating the top of the case and flared sides that house a smaller fan that helps keep the drive bays cool.

All in all, it's a great setup. The combination of case, motherboard, CPU, graphics and peripherals make for a gaming system most players would be more than happy with. And for £999.99, with an exceptional and most impressive leading five-year warranty package (two years' collect and return with parts, labour and courier costs and a further three years' labour only cover and lifetime telephone support), it's certainly one worth considering for your next big spend.



UK Gaming Computers

DETAILS
- **Price: £999**
- **Manufacturer: UK Gaming Computers**
- **Website: goo.gl/wdKjmx**
- **Warranty: Six years**

Our final group entry is from UK Gaming Computers, with another interesting mix of components and final system build.

UK Gaming Computers sent us the immensely striking Fractal Design Define 5 black case, a much silenced monolithic tower that's remarkably stylish. The package also contains an Asus VS247HR 24" monitor, a Corsair Raptor K30 keyboard, a Corsair Raptor M30 mouse, Corsair Raptor HS30 gaming headset, a large Raptor Gaming P9 high sensitive mouse pad and finally a code for *Batman: Arkham Knight*.

The inside of the system is made up of an Asus H81M-Plus motherboard, a stock cooled Intel Core i5-4460 processor running at 3.4GHz, 8GB of Corsair XMS RAM, a secondary Seagate Barracuda 1TB hard drive and a primary 120GB Samsung Evo 850 SSD with Windows 8.1 pre-installed.

The graphics card installed in the UK Gaming Computers system is an MSI GTX970 with 4GB of memory. The MSI GTX970 is an excellent gaming choice GPU; it's cost effective but can still deliver the necessary frame-rates for high to ultra graphical settings. The 3DMark11 score of all this hardware comes to 11143, which isn't too bad at all and places the UK Gaming Computers system entry at a respectable sixth place in terms of the returned numbers.



The impressive Fractal Design Define 5 case used by UK Gaming Computers is splendid



A good mix of components and peripherals here and an extremely long warranty

However, this isn't solely a numbers group; there are many other factors involved here that would stand out for the potential buyer. The system design in this case is certainly good, and we loved the style and overall looks of the Fractal Design Define 5 case. There's plenty of airflow within the chassis, with two large 120mm fans at the front and a further 120mm fan at the rear, so there's never really any need to replace the stock Intel cooler that came with the system. But the addition of a watercooling kit or far superior air cooling block wouldn't go amiss – especially if you were considering overclocking the CPU, which in this case isn't really up to the task. If UK Gaming Computers had used an i5-4690K, then there would be more room for overclocking.

The motherboard used here too is more than adequate for an entry-level gaming system, but we feel it's not quite up to the same standard as the likes of the Gigabyte 990XA-UD3 that we saw in the Orbit Indominus.

Those aren't necessarily negatives, though, and if you're looking for redeeming factors, here they are: Corsair gaming peripherals and a fast response 24" Asus monitor. Plus you get the UK Gaming Computers' standard (and group leading) return-to-base warranty of six years, which includes six years' labour cover, one year's parts and all RTB postage.

True enough, though, there are a couple of elements we'd like to have swapped out, such as the motherboard and CPU cooler, for example. But on the whole, the system from UK Gaming Computers is an impressive package for £999.99, and if you also factor in lifetime support via telephone and email, there's more than enough here to think about.









Falcon Computers

This is quite possibly the hardest group we've had to judge in a long time. However, in this instance, we feel that the system from Falcon Computers had the best overall mix of everything that a £1,000 gaming PC should have.



Chillblast

If the Best Overall was difficult, then the Highly Commended was nigh-on impossible to choose. However, we felt that the system from Chillblast deserved the award due to the components used, the build quality, performance and long warranty offered.

It's worth mentioning, though, that all the systems were extremely fine and shouldn't be considered as losing out. Take what you will from each and make your own decisions based on the specs provided.

How We Tested

Each entry was specified as a complete package, with monitor, keyboard, mouse and any other extras that would be of interest for the buyer. We ran 3DMark11 on each system to roughly gauge the gaming performance of the computer, but not as a defining indicator – although it certainly helps. The emphasis is on a combination of performance, quality of the build, quality of the individual components, upgradeability, free extras such as game codes, services or hardware and the type of warranty offered by the company – a combination we think is what most buyers will look for in system when spending up to £1,000.

	Box.co.uk Cube 703 Gaming Package	Falcon Computers system	Computer orBIT Orbit Indominus	Eclipse Computers Eclipse Titan	PC Specialist system	Epsilon Computers Red Star	Chillblast system	UK Gaming Computers
CPU	i5-4690K 3.5GHz	i5-4690K 4.5GHz	FX8320 4.2GHz	i5-4690K 3.5GHz	i5-4690K 4.6GHz	i5-4660 3.2GHz	i5-4690K 4.2GHz	i5-4660 3.4GHz
Memory	8GB	8GB	16GB	16GB	8GB	8GB	8GB	8GB
Graphics	MSI GTX960 2GB	Zotac GTX970 4GB	MSI GTX970 4GB	Palit GTX970 4GB	Palit GTX970 4GB	Sapphire R9 380 4GB	Zotac GTX970 4GB	MSI GTX970 4GB
Storage	120GB SSD, 1TB HDD	120GB SSD, 1TB HDD	120GB SSD, 1TB HDD	240GB SSD, 2TB HDD	250GB SSD, 1TB HDD	120GB SSD, 1TB HDD	1TB SSHD	120GB SSD, 1TB HDD
3DMark 11 score	9627	12324	11290	12006	11491	9353	11606	11143
Keyboard	CMStorm Octane	CMStorm Devastator	CMStorm Devastator	CMStorm Devastator	CMStorm Devastator	Corsair Raptor K30	I-Rocks K10	Corsair Raptor K30
Mouse	CMStorm Octane	CMStorm Devastator	CMStorm Devastator	CMStorm Devastator	CMStorm Devastator	Corsair Raptor M45	I-Rocks M09	Corsair Raptor M30
Monitor	BenQ RL2455HM	AOC E2460SH	AOC E2460SH	HKC 2615	AOC E2470Swda	Asus VS229NA	AOC E2460SH	Asus VS247HR

Your Letters

You Are What You Tweet

Seriously, what is the point of Twitter? I tried it when it first became popular and I tried it again recently, but I still don't understand why it exists. Not only does the character limit mean it's entirely superficial, but it just seems to be about how many 'followers' you can get, rather than any kind of meaningful interaction. You end up following random accounts, because they followed you first, then your feed get filled with all their nonsense. Oddly enough, the majority of this seems to be tips on how to get more followers on Twitter.

In the end, you get so tired of self-help advice and teenagers spouting rubbish, that you just 'mute' them, so you don't see their 'tweets' but you're still following them – further proving the point that it's just about how many followers you have. In fact, you could have a million followers, but only one of them could be actually reading what you post.

That, though, seems to be the way of the world. Everything arrives more quickly, but it's so much more superficial. You read an article on the web, and it's rarely longer than 500 words. In a newspaper or magazine, that would just look weird, and readers would demand more.

Of course, if you can be bothered to look fo it, long form journalism does exist on the web. It's comparatively rare, though. People don't want to read long articles on a screen, and that's fair enough, but I can't help thinking that's making us all a bit stupider. That's why paper is still king for me, and why I still enjoy *Micro Mart* so much.

Perhaps I should tweet about it?

Thomas Edwards

A Little Respect

Not long now until Windows 10 is out, and I'm curious to see if Microsoft have actually listened to their customers this time around, rather than just buying their heads in the sand and doing as they please – like normal. It's not just Microsoft that ignores its customers, of course, and it got me thinking. Why do big companies often show such disregard for the very people that have made them rich?

Nokia, for example, spent years ignoring what their customers were after, and just said, "No, you don't want that. You want this other thing that we've made. Look!"

RIM (now BlackBerry) did exactly the same thing. Rather than accepting that they should just sell Android phones like everyone else, they tried to inform the world that it was wrong, that they knew better.

Of course, we all know how things turned out for these two, don't we? In fact, history is littered with companies that have fallen as a result of hubris. I see signs of that today as well, not only with Microsoft but with Samsung too. Not to mention laptop makers, who fill their systems with crap. Eventually, this will all come back to bite them in the bum (unless we're talking about Apple, in which case it can do what it likes and the iSheep simply follow).

How do these terrible decisions get made? It's because of people like Stephen Elop (nicely described by Mark Pickavance); If you're constantly rewarded for failure, you're inevitably going to think you're incapable of doing a bad job. So people like Elop and Thorsten Hein (of BlackBerry) will never learn their lesson, and they'll never feel the need to respect us, the ones who actually put money in their pockets.

Ben Donnings

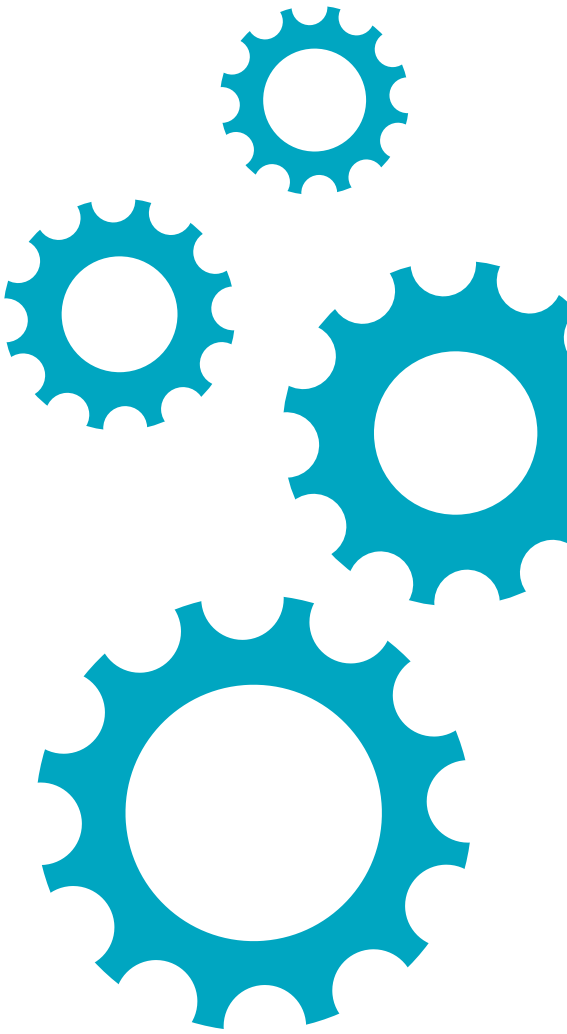
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What Do Router Settings Actually Mean?



Keir Thomas delves into his router's configuration panels to provide a quick and simple guide to getting the most from your network hardware

Internet technology is designed to be as simple as possible to understand, but it's simultaneously clogged up with confusing terminology. In this feature we will be going through the terms and technologies you're likely to encounter while delving into your router's settings screens; we use a BT Home Hub 5 for the purposes of dissection, and BT still has the lion's share of ADSL broadband customers in the UK, but what's discussed is common across all kinds of wi-fi routers.

The Home Hub provides some elementary configuration options via the Settings tab, but we're going to jump straight into the juicier options by clicking the Advanced Settings button. Click this if you want to play along at home and click the Wireless heading beneath to get started. If prompted for a username and/or password, look at the card that came with the Home Hub, or at the sticker on the bottom of it. Note that some mean ISPs essentially block access to the deeper settings of their routers by not sharing the username or password – although a quick Google may well reveal such forbidden fruit.

What Wi-fi?

As is common for recent models of ADSL routers, our Home Hub 5 transmits and receives on both the 2.4GHz and 5GHz wireless channel ranges, as is demonstrated by the separate 2.4GHz Wireless and 5GHz Wireless menu options. By default on the Home Hub both frequency ranges are synced with each other, which means they share the same wireless network name (SSID) and password, allowing computers and devices can choose which they want. However, on the Home Hub each frequency band can also be set to operate independently.

It's a common misconception that wireless frequency has a direct correlation with speed. It's true that the faster 802.11ac standard uses exclusively the 5GHz range, but then again so did the very first 802.11a wi-fi standard, cleared for use back in 1999.

However, none of this means a hill of beans if your computers and devices are not compatible with 5GHz. Support is increasingly common, but older or less expensive devices might support only 2.4GHz. To find out what your PC supports, open a command prompt (click the Start button and type cmd), and then type:

```
netsh wlan show drivers
```

If you see 802.11ac listed at the bottom of the output. then your computer supports 5GHz.

Because the 802.11b/g wi-fi standards uses 2.4GHz, and these were the standards that made wi-fi popular over the last decade, the 2.4GHz frequency range is typically very congested. In short, everybody's using it. Wi-fi is built to cope, but at the price of data rate slowdowns or even lost connections.

This isn't helped by the fact that, while the popular 2.4GHz range claims to offer 13 separate channels, in reality the signals occupying



➤ *Routers like the BT Home Hub 5 allow access to some although not all the useful settings, and it's increasingly rare for routers to allow all configuration options to be altered*

the range overlap and interfere with each other. In fact, only small groups of channels can be used without overlapping – typically one, six and 11 (or two, seven and 12, or three, eight and 13, or four and nine, or five and 10). This is why most routers default to channels one or six. It also means that manually selecting something like channel two if you're experiencing wi-fi issues might not solve your problem because channel two overlaps with one, three, four, five and even six to some degree.

Choosing a wi-fi channel can be something akin to a black art, dependent entirely on local circumstances. However, like many routers, our Home Hub offers a 'Smart' toggle that aims to analyse radio traffic in the locality to choose the best option. This is wise because congestion isn't the only issue: both wi-fi frequency ranges are unlicensed, which is to say anybody can transmit anything on them without governmental permission (unlike the frequencies used by mobile phones, for example, or those reserved for digital TV or armed forces use). Because of this the 2.4GHz range is also home to some DECT wireless phones and automated garage opening devices, and microwave ovens also generate noise at that frequency.

Switching to 5GHz isn't a perfect solution. There's still interference from some household devices (microwave ovens again, amongst other things) but the most damning issue is the distance a signal can travel decreases the higher its frequency. Thus, a 5GHz wi-fi signal might not struggle to get through the floors and walls of a house to a back bedroom, even through 2.4GHz might be received there without hindrance. Ergo, 5GHz is ideal – and only offers those fast 802.11ac data speeds – when you're in the same as the router, or pretty nearby. (And you do know that the data rate you're likely to get over wi-fi has no bearing on what the box says, don't you?)

However, if you want to utilise the faster 802.11ac wi-fi standard then you've no choice but to use 5GHz. In most situations choosing the 5GHz frequency range does make sense, not only is it much less congested, it benefits from the fact that unlike 2.4GHz there's more available channels to choose from and no channel overlap.

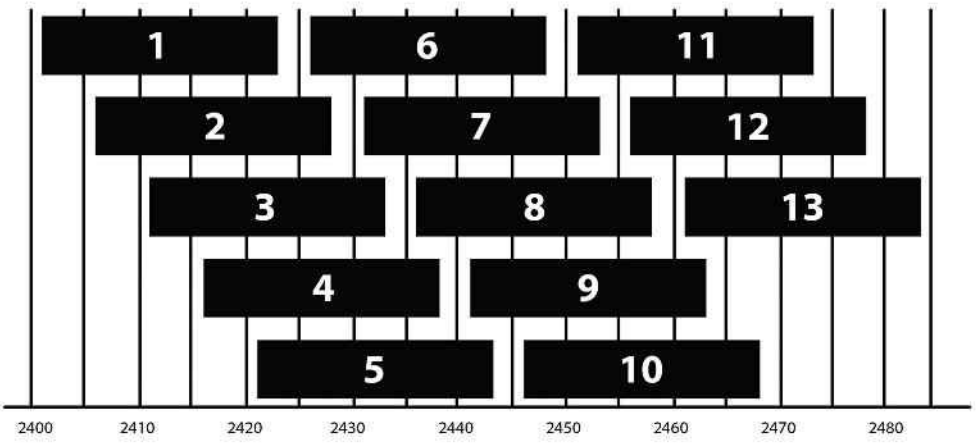
Broadband

Clicking the Broadband > Internet menu option on our Home Hub shows a dashboard display of wide area network (WAN) details – which is to say, our Internet IP address as well as the Internet gateway and DNS servers the router is using. Above this is the broadband sign-in username, which our Home Hub doesn't let us change – although some routers from other ISPs do. Changing these details can be useful if you're using a router provided by one ISP after switching to another provider. However, if you're using a fibre connection, or your local exchange has local loop unbundling (LLU), then the username and password are ignored (although something must be typed into them). Unfortunately, there's not space here to describe what LLU is, you'll have to look that up for yourselves.

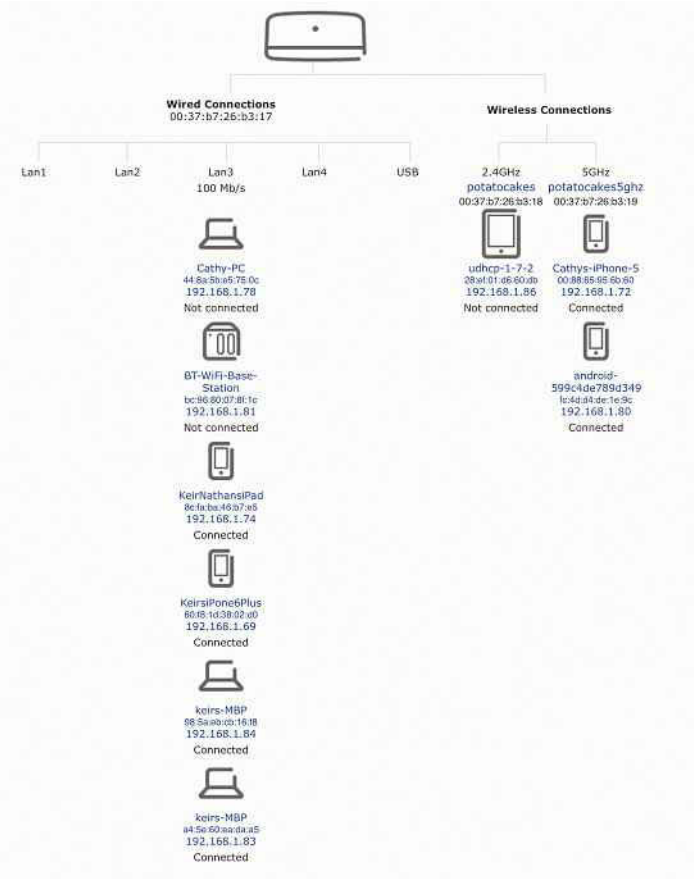
The Broadband > VPN heading of our Home Hub settings screen lets us clamp UDP port 500. This sounds painful, but means that any virtual private networking (VPN) software used by a computer or device on the network can initiate a connection via port 500, rather than via a constantly varying port number (which is considered more secure). Put simply, if you're using a VPN, and are having trouble connecting then it's worth setting this – and don't forget that VPN connections aren't just found in business environment nowadays, BitTorrent anonymisers use them, for example.

The Broadband > Dynamic DNS menu option lets us configure a hostname for the router. Essentially, this means we can set a name by which we'll always be able to reach our router from elsewhere on the internet, rather than typing its IP address (which will change each time the router disconnects and reconnects). Dynamic DNS hostnames are typically a third-level domain name like johnsmith.dyndns.com and how they works is pretty simple – the router periodically contacts the dynamic DNS server that you've signed up to in order to give an update on its IP address. Therefore, if the router's IP address changes (if the router reboots, or loses power for example) then the dynamic DNS will be aware within minutes.

Our Home Hub is compatible with the DyDNS, DynDNS, NoIP, **changeip.com**, **tzo,com**, **easydns.com** and **zoneedit.com** services



➤ *The 2.4GHz wi-fi ystem involves overlapping channels, meaning that only three (or two) channels if used in the absence of all other channels ever have a hope of avoiding interference*



Some routers allow you to configure the 2.4 and 5GHz wi-fi networks independently, choosing on each computer or device which you want to connect to

although in actual fact the list is longer because services not listed emulate existing offerings like DynDNS. Whichever service you choose, you'll have to provide the username and password details that you configured with that service, as well as the hostname you chose, which should be typed in the Host field. The Home Hub allows you to setup multiple dynamic DNS hosts, which can be useful if you want to create a handful of fall-back services in case one proves unreliable. Considering many services offer a free tier, this can be a good idea.

Home Network

Clicking the Home Network > Devices menu option of our Home Hub shows a nice diagram of what devices are connected, and via which method (wi-fi 2.4/5GHz, Ethernet etc) – along with their hostnames and MAC addresses (that is, the unique address of the networking hardware).

The Home Network > Smart Setup lets us turn off a somewhat irritating feature of the Home Hub, which is that it automatically directs any new device or computer that connects to a welcome page at the BT website.

The Home Network > IP Addresses option lets us configure the dynamic host control protocol (DHCP) server. All home Internet routers use network address translation (NAT), and it's so commonplace that it's not even mentioned in router specification lists any longer. NAT lets all the computers on a network use a single public (WAN) IP address. In other words, if your tablet requests a movie then NAT will request that data via the public IP address and – crucially – remember this request so that it can route the video back to the tablet's private network address once it's been received. NAT does hundreds of operations like this every second.

For NAT to work the router needs to create a private home network and Dynamic Host Configuration Protocol (DHCP) is the component that hands out private network IP addresses to each device or computer. The Home Hub lets us set the network address range we want to use – most routers default to the 192.168.1.* range, but our Home Hub also lets us choose the 172.16.*.* range, or even configure our own range. All these network IP address ranges are referred to as non-routable, which is to say any router on the Internet will not recognise them because they've been set aside solely for use on private networks, such as our home network.

When the DHCP component of the router hands out an IP address, it also gives the computer or device a lease time. This is just the same as if you lease a car or even a house – the computer is given the address for a certain time period and relinquishes it at the end. The default lease time for our Home Hub's HDCP server is one day but, whatever the case, leasing is moot on most routers because the device is simply given the same IP address again when the lease expires.

IP Versions

Currently the Internet runs largely on the IPv4 addressing system and protocol, but IPv6 is waiting in the wings to take its place. Like many modern routers our Home Hub is future-proofed to some extent, and the Broadband > IPv6 Status menu option theoretically allows us to configure our IPv6 settings. At present, though, this reads Disabled because no ISP – including BT – has yet rolled out IPv6 support beyond very limited testing phases. This is no bad thing because not

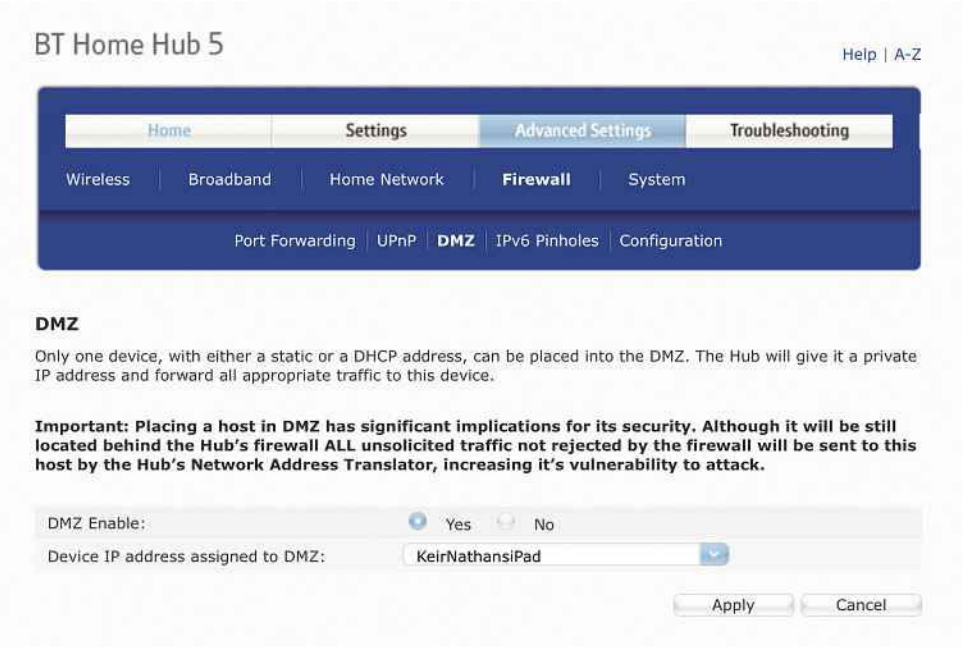
> **“In the same way their real-world analogue handles shipping, a port provides a unique landing spot for incoming data”**

all websites or Internet services are compatible with IPv6, and it's not yet clear whether it can ever really become a true default standard.

The Home Network > IPv6 Configuration screen lets you configure IPv6 for the local network too but, again, this is not currently in use on the Home Hub. However, you can switch on and off the Unique Local Address (ULA) component of the IPv6 system. Like NAT, this configures the local network to use non-routable IPv6 addresses, thereby creating a private local network. ULA is enabled by default, but we might consider disabling this if some devices or PCs have trouble connecting because some crazy operating systems and handhelds attempt to connect via IPv6 before dropping back to IPv4 – which can cause odd delays when visiting websites. Often disabling IPv6 on the computer is the best solution, but on handhelds this might not be possible, making router configuration the only option.

Firewall

With all our apps on each computer or device requesting data, it's a miracle that data isn't received by the wrong app. Well, actually it's not a miracle. It's all down to the port system. In the same way as their real-world analogues handle shipping, ports provide a unique landing spot for incoming data that software can use to ensure only it gets the data. There are 65,535 ports, in fact, and apps are free to use any of them (although there's a semi-official list of “well known” ports that shouldn't be used for other purposes – see **goo.gl/9yVo9y**).



The Demilitarised Zone (DMZ) feature of routers lets you place a computer on the raw Internet, so that all data not specifically requested is sent to it

The Firewall > Port Forwarding screen lets you force the router to send all data received on a particular Internet port to a particular computer or device on the network. This is necessary because a basic limitation of NAT is that it can only route data it has requested. To return to the earlier analogy, it can only pass the video to your tablet if your tablet has first requested it. That's fine for YouTube, but what if you've a VoIP phone app through which you might answer incoming calls that are unpredictable and also not explicitly requested by the app? That's where port forwarding comes into play – you can tell the router to simply pass through all data arriving at a certain port number to a computer or device on the local network of your choice.

The Home Hub comes with several preconfigured port forwarding rules for games and apps, but the Home Hub lets us create our own by clicking the Manage Games and Applications button, and then clicking Add New Game or Application. First, we tell the Home Hub what protocol to use: the Any option will forward both TCP and UDP, and is the best option, although you can specifically choose either. We also need to set the port range to forward, and can also opt to translate it to a different port on the network – incoming data on port 555 could be passed through to port 600 on a phone, for example. It's rare we'd need to do this outside of a business environment, though.

The Home Hub anticipates us typing a range of ports (that is, ports 20-32, for example) but if we want to forward just a single port then we type it into both fields – to forward port 500, for example, we type 500 into both Port Range fields and also into both Translate To fields.

Another option for port forwarding is to put a particular computer or device into the demilitarised zone (DMZ). On the Home Hub this can be configured by clicking Firewall > DMZ. When a computer is placed in the DMZ, all data not specifically requested by the router will be passed straight through to the computer or device in the DMZ (and as such the DMZ can only contain one computer or device). It's a bit like putting the computer or device straight into the Internet, just like in the old days when ADSL modems connected to a PC via USB. As such the DMZ is a good way of testing an app that refuses to work via port forwarding but because of the risk of hack attack it's not an ideal full-time solution. If you're running something like a public mail or web server you might place in the DMZ for basic convenience and to avoid configuration, although beware that most ISP terms and conditions don't allow users to run their own Internet-facing servers.

Plug And Play

Also within the Firewall component of the Home Hub is an option to switch on and off Universal Plug and Play (UPnP), which lets devices communicate with each other without the user being aware. Thus, a media centre PC can make its files available to other devices without configuration, or a scanner can make itself available to all PCs on a network. Terrific, right? Of course not.

UPnP is blindsided by two issues. the first is a complete lack of authentication; no usernames or passwords are required for UPnP to work, meaning any computer on the local network is automatically trusted and considered secure. We all know that PCs and tablets/phones are under constant threat from malware and that even if we consider them to be secure, they may not be (if you have kids, abandon hope of anything like a secure network). The second issue is that most UPnP implementations include Internet Gateway Device (IGD) support, which lets devices on the Internet probe beyond the local network to discover the router's IP address and also configure port forwarding. Again, this happens without the user being aware and can be used by a Trojan to create an easy direct connection to your PC in order to add it to a botnet. Many people disable UPnP and even the US Department of Homeland Security consider it a wise step.

The Firewall > Configuration option allows access to the Home Hub's only dedicated firewall tool outside of NAT. The Defaults allow you to deny all unsolicited incoming traffic except those configured in the port forwarding rules – but allow through everything otherwise. Some routers refer to this option as making the router invisible because it won't respond to pings from elsewhere on the Internet, by which hackers can discover new targets.

The Disabled option in the firewall is like the Default option, except that it means the router will act like all good Internet hardware and let through outgoing traffic and incoming traffic that's specifically requested or allowed via port forwarding. It also means the router responds to pings, which can be useful if you need technical support.

Block All essentially turns the router into a brick wall and cuts the Internet off for all computers and devices on the local network. This is a quick and effective emergency brake should a computer on the network become infected with a virus and start leaking data.

Interestingly, our Home Hub includes a IPv6 Pinholes option that lets us theoretically undertake the equivalent of port forwarding if IPv6 is use. Again, it is not enabled. **mm**

The Download Directory



James Hunt scours the internet for the best freeware, shareware and paid-for application releases

This month, The Download Directory's collection of offbeat and largely unexplored applications includes Malwarebytes Anti-Exploit, a security app to protect you from web vulnerabilities; MediaPurge, a program for eliminating duplicate audio from your MP3 collection, Imagina, an image editor that aims for the oft-ignored middle ground of image manipulation, and AstroGrep, a powerful search tool that replicates the powerful features of Linux and Unix searches – in Windows!

Malwarebytes Anti-Exploit 1.07

Release Type: Freeware
Official Site: www.malwarebytes.org

Malwarebytes' Anti-Malware tool has consistently been one of the best free security applications you can get, so it's always good to see it expanding its suite. In this case, the company has recently bought and rebranded ZeroVulnerabilityLabs' ExploitShield as Malwarebytes Anti-Exploit. So can it live up to the pedigree it's been folded into?

Generally speaking, it can. The tool is designed to protect major applications from zero-day exploits that may not have been officially patched out and web-based vulnerabilities. The full list of compatible software includes all of the major browsers (Firefox Chrome, Internet Explorer and Opera); suites like Microsoft Office; media players like Windows Media Player, VLC, Winamp and Quicktime; and PDF tools like Adobe and Foxit reader.

The application doesn't require any specific configuration; as soon as it's installed it'll set up resident in memory and protect any programs as they run. Don't worry about your system resources. Even at full capacity it only hangs onto 3MB of RAM, which is less than most Firefox tabs. You'd need to have an incredibly basic system to witness even a small effect on performance from running it.

If you want to know whether the program is actually of any value, you can right-click on the system tray icon and select 'Show Malwarebytes Anti-Exploit', which will bring up the main window and give you details about how many potential threats have been blocked, or access to the logs so you know when the latest activity occurred. You can also use it to stop and start protection, which is useful if you notice any problems with operation of the protected applications that may not have been anticipated by the developers on either side.

The latest version of the program adds a number of new protections for things like VB scripting, Powershell abuse, and support for Windows 10. There's also a blacklist for programs using fraudulent and pirated licence keys, so if you're trying to use it with illegally downloaded software your protection days are numbered!

Generally speaking it's not quite as essential a tool as Malwarebytes' more popular flagship suite, but the footprint is so low (and the rewards so potentially great) that it's hard to argue



against downloading it. Simple to use, seamlessly integrated and generally ahead of the curve, it's hard to come up with any criticisms of it.

Of course, the rare nature of the threats means that it's difficult to prove that it actually works, because we have no easy way to test this. But we're assuming from its pedigree that it does work, and we'd say it's worth installing until such time as you think otherwise.

Pros: Miniscule resource footprint
Cons: Only rarely useful
Rating: 5/5

MediaPurge 5.61a

Release Type: Freeware
Official Site: www.peter-ebe.de/en/index.html

Managing a digital collection of music can be hard, especially if you're trying to ensure that you don't end up dedicating space to duplicates. No one wants to go through the process of tagging and sorting files knowing that they're covering ground they've already done, and likewise, you don't want to delete a file thinking you have a spare copy when you haven't. And that's why you need MediaPurge.

A freeware application designed to let you manage a collection of videos and audio, MediaPurge allows you to compare files using a huge variety of attributes. Compare filesize and tag contents for a cursory skim of your collection, eliminate based on a checksum to ensure identical files are wiped, or even use the built-in 'acoustic fingerprint' sensor, which can actually match two different rips of the same song even from different sources. Ideal if you're ripping compilation CDs or best-of albums and don't want to go through them manually!

Although that sounds quite involved, it's actually quite fast. Expect it to process around ten songs per second. Large collections might take a while, but on the plus side it's not like that's a scan you'll have to run multiple times. Once will be enough for a considerable amount of time.

In addition to its duplicate-deletion capabilities, MediaPurge can also automatically organise your files, turning cluttered directories into a uniform structure based on their tags. And if your tags aren't in order, the built-in tag editor can be used to change, copy or completely strip out ID3 information and turn that info into filenames (or turn filenames into tag info).

Perhaps best of all, there's even a tool for comparing two collections, so if you're combining music from multiple machines, it'll spit out a report on which songs you have more than once and give you the opportunity to ditch the duplicates on one side – or not, if you're just interested in filling in the missing gaps and want to synchronise the pair.

Although the program has a number of fairly simple features, the sheer number of them means it can take a while to get to grips with it. Also slightly unhelpful is the software's rather spotty English translation. It's far from unreadable and nowhere near as bad as certain Chinese software suites can come out with on occasion, but it does add to a general homemade ramshackle feeling that doesn't fairly reflect the software's abilities. A little more work and it could be fantastic. As it is, it's just good enough.

Pros: Loads of features, audio fingerprinting especially impressive
Cons: Poor English translation makes it slightly harder to use
Rating: 3/5

Imagina 1.9

Release Type: Freeware
Official Site: www.planetimagina.com

Most image editing suites are attempting to be clones of Adobe Photoshop, which means they're usually stuffed with features that vast sections of the user base have no intention of ever using. The alternative, Microsoft Paint, is too far the other way, lacking some of the most basic nuances an image editor should be able to provide.

Imagina is nestled quite neatly between those two extremes. Unlike most image editors, it doesn't include any drawing tools or effects filters, but it does include a number of more professional editing options that you might use to tweak an image. Of course you can do the basics, like rotation, flipping, resizing and cropping, but you can also you can do more advanced things, like change colour management options to apply everything from rendering intent, gamut checking and colourmetrics to your image collection.

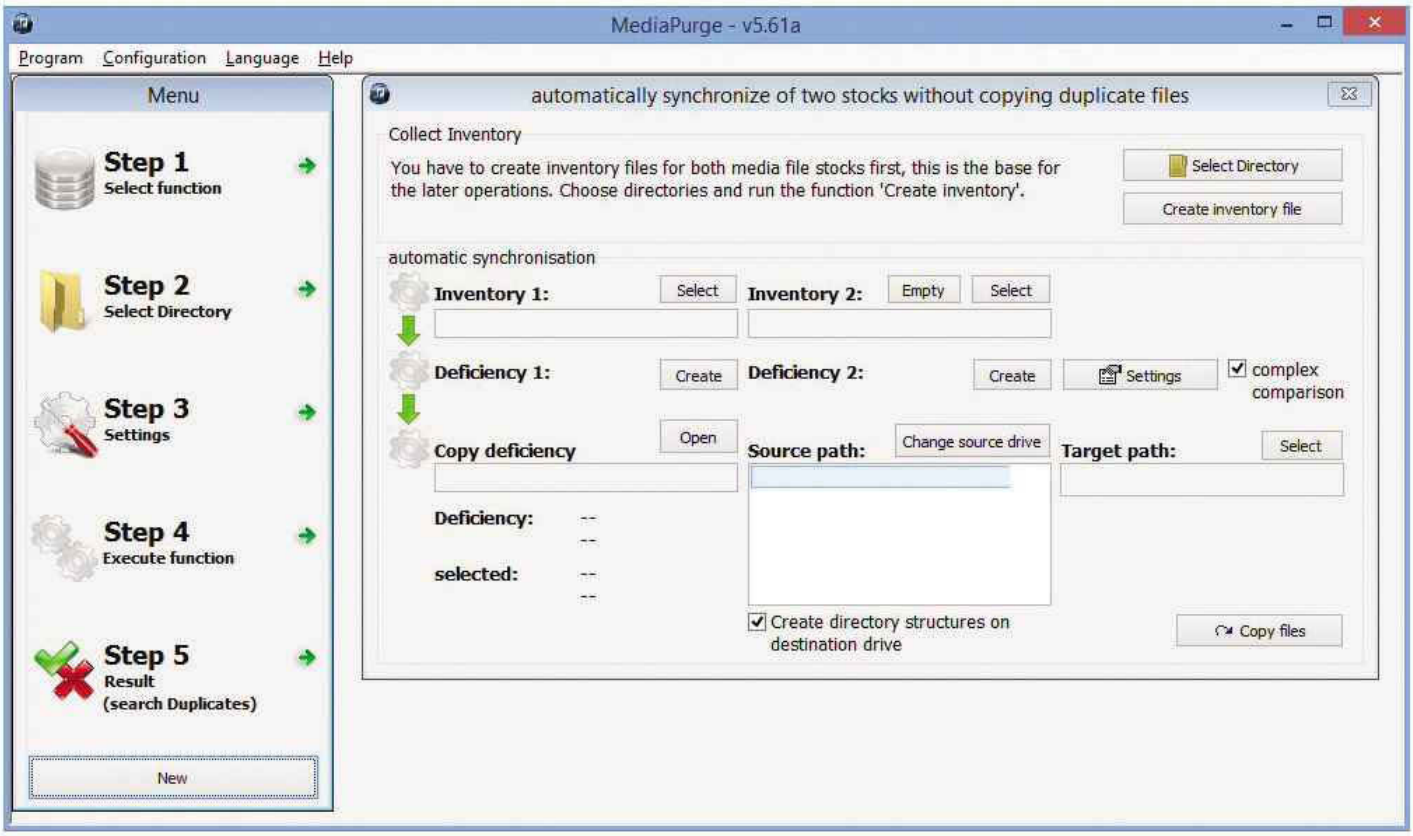
A built-in thumbnail browser allows you easy access to your collection, and while the 3D Desktop view is a little too gimmicky for our tastes, you can change it to view a more standard 2D presentation or browse pictures in full-screen mode. Hardware support means that images are quickly and efficiently browsed and manipulated, with none of the jerky or slow redrawing you see in many non-accelerated packages.

Most of the processing options give you a substantial level of fine control over what's going on, so you never feel like you don't have much input into the way the image is processed – something that can happen on similar tablet applications where you can only process rather than directly manipulate the image. If you select the option to reduce image noise, it's not a single-pass, one-size-fits-all filter: you get the option to choose between multiple types of noise based on the source of your photo and specific problem with it, from JPEG artefacts to dust and scratches.

One tool not found in most editors is the ability to view GPS locations extracted from photo metadata, so you can locate the exact place the picture was taken using either Bing of Google Maps. It's a feature common for web apps but rare in desktop ones. You also get a few fun toys, including the ubiquitous Instragram-style period-photo filter, which makes images look aged in ways more nuanced than a simple sepia filter might.

None of this is to say the program has everything. There's a distinct lack of any 'sharpen' feature, for example, which might prove annoying if you only notice it once you try to use it, but in general it's better than the basic editors and simpler than the advanced ones. We're not 100% sure there's an audience for that middle ground, but if there is, then Imagina deserves to capture it.

Pros: Tons of features
Cons: Misses out a couple of big ones
Rating: 4/5



Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can't wait for new features? Now you don't have to!

Firefox 39.0 Beta

www.mozilla.org/en-US/firefox/39.0beta/releasenotes

Fresh off the addition of its messaging platform Hello to Firefox, Mozilla is continuing to plough improvements into its flagship browser. Most notable is the ability to link Firefox Hello to existing social media accounts for closer integration. Admittedly it doesn't look like many people are actually using Hello, but maybe they will be once this feature gets going!

Mac OS X users can also expect smoother scrolling and animations thanks to the rollout of Project Silk, while users of all platforms have better support for web accessibility technology ARIA 1.1 and support for the various skin tones introduced for each emoji in Unicode 8.0.

HTML5 also gets a fairly big focus in this update, with List style types now supported, fixes to CSS transitions and animations, more secure implementation of the preconnect property and support for CSS scroll snap points. And all of this on top of the usual bug fixes and developer refinements.

As ever, it's available to download now, and we encourage it completely for anyone who likes to see new features as quickly as possible. Firefox betas are never anything less than rock solid, so unless your life depends on a specific plug-in maintaining compatibility, it's time to try it out.

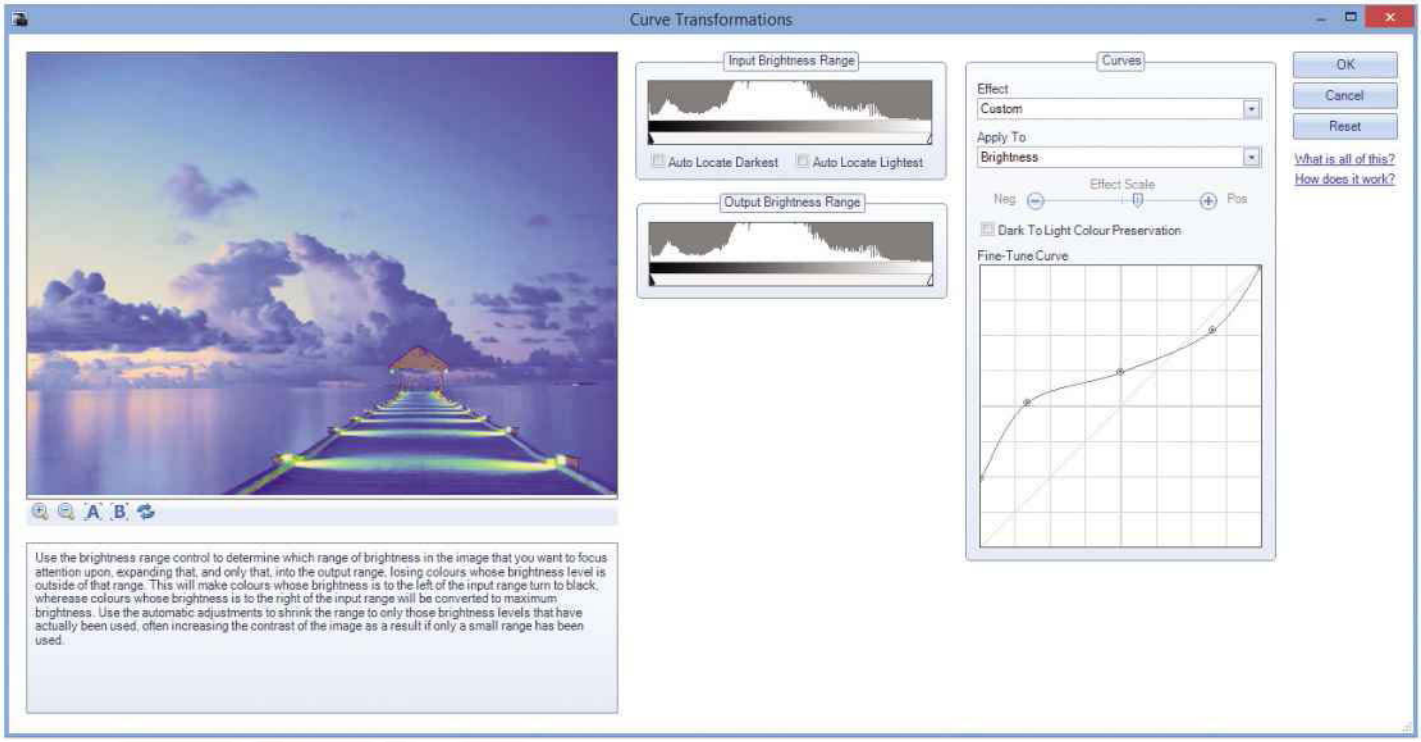
WordPress 4.3 Beta 1

wordpress.org/news/2015/07/wordpress-4-3-beta-1

Uber-popular blogging platform WordPress has released a new beta this month, with version 4.3 beta 1 giving access to new features ahead of its official release in August.

New features include the ability to manage menus using the customiser (with live previews), a site icon settings page so you can manage your favicon and app icon independently from within the site backend, much better password security features so passwords can expire or be securely generated for you, and a number of editor improvements including plaintext shortcuts for formatting like bold, italics and blockquotes.

As usual, this WordPress beta hasn't been fully security vetted, so it's not recommended for use on a live site and it's deployed at your own risk. However, if you want to apply it to a backup to see the new features, that's probably the safest way of doing it. Just don't blame us if an SQL injection wipes your entire table off the face of the internet!



ReDownloaded

This month, in our regular retrospective section, we're looking back at the June 2013 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

WinMend File Copy

www.winmend.com/file-copy
Reviewed Version: 1.0, Current Version: 1.4.1

A paid-for file-transfer application that definitively improves on Windows' molasses-slow version, WinMend File Copy contains the single most useful feature that's missing from Windows: the ability to overwrite a file only if the name *and* filesize match, eliminating duplicates with ease. Updates seem to be mostly bugfixes rather than new features, and it still doesn't integrate with Explorer – but those qualms aside, it appears to be doing well. Still recommended.

IObit Driver Booster

www.iobit.com/driver-booster.php
Reviewed Version: 3.1 Beta, Current Version: 2.3.1

That version number is actually a little misleading – this is IObit Driver Booster 2 version 2.3.1, so it's gone some distance from the original release to the point of being essentially renamed. It's still a simple tool, but now it has far more options and can even install drivers seamlessly without even handing over to the Windows driver-installation interface. Definitely worth a look if you enjoy the idea of automating updates. It's not the only program in its class, but it's one of the better examples.

SoftPerfect Wifi Guard

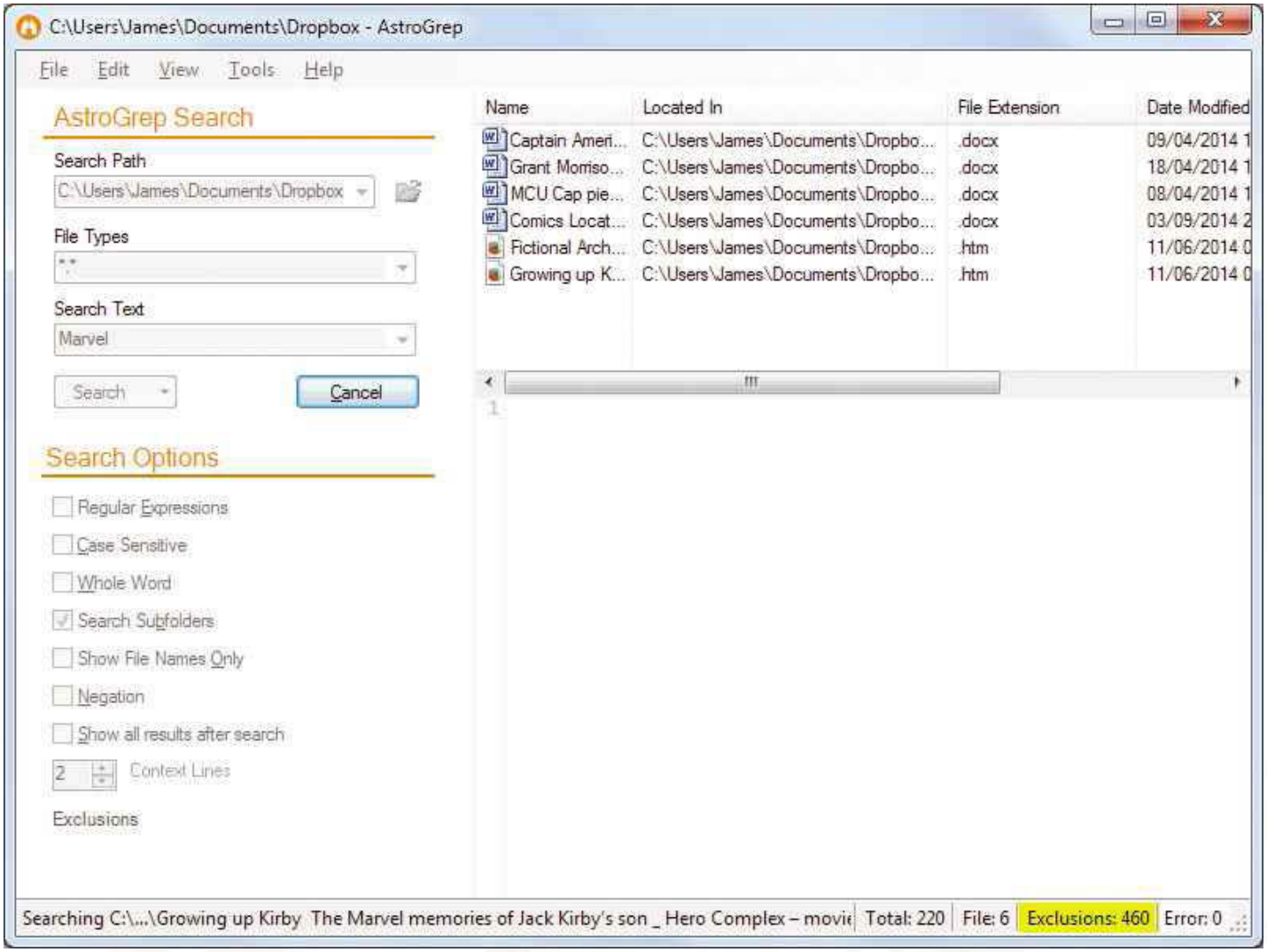
www.softperfect.com/products/wifiguard
Reviewed Version: 1.0.3, Current Version: 1.0.5

A small applet that gives you feedback on the contents of your network by automatically pinging local IP addresses, SoftPerfect Wifi Guard was never particularly bad, but it was a little too basic for its own good. It gives you no information that most routers won't already offer, and despite the name it's not really a security tool. The fact that it's only been updated with two minor bugfix releases in the two years since we reviewed it – last in September 2014 – suggests that even the people making the software know that it's never going to be anything more than this.

LinuxLive USB Creator Guard

www.linuxliveusb.com
Reviewed Version: 2.8.23, Current Version: 2.9.3

This excellent tool for creating portable, USB-based installations for Linux hasn't moved particularly far since we last looked at it, but that doesn't matter in the slightest, because even then it was well ahead of the game. If you've ever wanted to try Linux but don't like the idea of putting Windows at risk to do so, this is the tool you've been waiting for. Still fantastically useful, whether you're a beginner or a seasoned Linux pro.



AstroGrep 4.4.3

Release Type: Open source
Official Site: astrogrep.sourceforge.net

If you've ever used Unix or Linux, you'll know that the 'grep' search tool is both incredibly useful and incredibly powerful. It's also lacking anything like an equivalent on Windows, which can make for a jarring comedown if you're trying to find all instances of a certain filetype containing a certain word. It's almost hard to overstate quite how bad the Windows native search is at both performing that task and displaying the results.

Enter AstroGrep, a tool that takes on the capabilities of grep searches, but presents them in a Windows-friendly GUI so you can quickly perform them without even having to figure out the command line.

AstroGrep doesn't have access to the Windows indexes, and that makes the searches relatively slow. Indeed, that's sort of why Windows doesn't do grep-style searching by default – its file system isn't really set up for it. But what it lacks in speed it makes up for in size and configurability. AstroGrep itself is just 300MB when running, and doesn't use much more RAM than that to operate. It's fully portable so you don't have to install it to use the search functions, making it a great addition to any toolkit.

Searches are hugely configurable. Restrict them to specific drives, directories or subdirectories, restrict by file type, file size, file dates and so much more. You can even use regular expressions to get ultra-specific with what you want it to find and where, as long as you know how RegExp works. If you don't, standard keyword searches work just as well.

As the files are sorted you'll see all kinds of statistics and information being imparted to you. You don't even have to wait for the search to complete before you can start acting on the results – something Windows in particular would do well to learn from. If you click a document in the search window, AstroGrep will do its best to offer you a preview of the place the search term was found, regardless of whether it's in plain text or nestled within a binary file.

Clearly, it's a different beast to the standard Windows search tool, and in many ways it's much better for a certain type of search. If you're less interested in the contents of files than the filename, then maybe it isn't a huge amount of use, but its compactness and complexity mean we're willing to overlook any of its more minor flaws.

And hey, if you don't like it, feel free to change it. It is, after all, an open source program. Can't say fairer than that.

Pros: Super-powerful and configurable
Cons: Needs RegExp knowledge to work best
Rating: 5/5

There you have it! A fantastic collection of programs this month, all of which earned the high ratings they deserve. Remember, if you have any programs that you'd like to see us look at – whether it's something you want to find, something you like and want to share, or even a program you've written and want us to review – don't hang around. Get in touch, and we'll make sure it ends up in the download directories everywhere – courtesy of The Download Directory! **mm**

Remembering...
Sega Dreamcast

David Hayward looks back at one of the best consoles ever made

By the late 90s, the console had well and truly taken over as the dominant gaming platform of the living room, while the PC was relegated to the corner of the bedroom or some other smaller room in the house.

After the magnificent success of the Master System, followed by the record beating popularity of the Mega Drive, Sega had a little blip. The poor Saturn, despite being well ahead of its time in terms of processing power, failed to warm to the buying public, who instead opted for the Nintendo 64 and Sony PlayStation.

The poor sales of the Saturn hurt Sega, and as a last ditch effort it launched what I believe as one of the finest consoles ever, the Sega Dreamcast.

The Sega Dreamcast was an immensely impressive machine. It looked cool, you could go online with it, and the controller was as futuristic as you could possibly get. Sega created the perfect console, in almost every way. It had a GD ROM drive, arcade like graphics, a 32-bit processor and a 33K modem. The controller had the VMU Memory Card, a built-in LCD screen that could play mini-games, show extra info in-game (like what your inventory held), and you could swap cards with friends for multiplayer gaming. Everything, I might add, that the Wii-U now does nearly 16 years later.

The games too were beyond anything we as gamers had seen on our humble TVs. The likes of *Soul Calibur*, *Crazy Taxi*, *Skies of Arcadia* (remember that awful music?,) *Power Stone 2*, *Jet Set Radio* and *Sega GT*. Of course the legendary *Shenmue* shouldn't be left out either, but it's one I sadly never played.

Its History

It's a strange sequence of events that both created and killed off the Dreamcast. The Saturn was just far too expensive to make, compared to the PlayStation. Despite dropping the cost of the Saturn significantly, Sega just couldn't recoup its losses on the Saturn.

The Dreamcast, therefore, was to be engineered with off-the-shelf components, most notably 3dfx Voodoo Banshee GPUs. However, 3dfx jumped the gun and, without prior permission, announced its partnership with Sega on this new console, resulting in the company losing favour with Sega, which then dropped 3dfx for PowerVR2 and Hitachi SH-4 RISC processors.

When Dreamcast hit the shelves in the West, it made Sega a whopping $100 million on its first day on sale. Mere months later, sales of the console were well over a million, and Sega was close to becoming the crowned king of the home console once more.

Then, less than a year after the Dreamcast was winning new audiences, Sony released the console that killed off pretty much everything in its path: the Playstation 2. The PS2 was more expensive, but it was a pure gaming system that spoke to the masses in a language they could understand.

The result was Sega losing money by the second and the final swansong of the company as a console developer. Then Microsoft announced the impending launch of the Xbox, Nintendo the Gamecube and there were countless more advances in PC gaming and faster online content. The Dreamcast was dead, and Sega announced it was leaving the console market for good.

Did You Know...

- Microsoft helped designs elements of the Dreamcast, which it incorporated into the original Xbox. It even made a version of Windows CE that was compatible with the Dreamcast.
- *Shenmue 2* cost over $70 million dollars to make for the Dreamcast.
- The logo of the Dreamcast means Origin of Power.
- Homebrew developers are still making games for the Dreamcast.
- It was the first console to use a camera, the Dreameye.

The Good

Amazing graphics, online via the modem, the VMU Memory Card

The Bad

The laser had the nasty habit of going off target, and you often had to take the console apart to fix it. Although it looks great when new, it doesn't age too well.

Conclusion

The Dreamcast was a splendid console and one we'll miss. **mm**



The Sega Dreamcast. Note the red swirl logo: red was for the US units, blue for Europe and orange for eastern

RETRO ROUND-UP

Alone in deep space sits Ace Commander Edwards, smoking his kuipers and eating seeds for breakfast before popping a magic pill to take his waistline back down to 32'. That's all happening in this month's round-up of newly released retro games

Unwritten Rules

Over the past six months, we've looked at a fair slice of both new homebrew retro software and the archive sites that occasionally surprise us with some undiscovered long-thought-lost project. Along the way I have developed a set of so-far 'unwritten rules' for what I will and will not include in it and, for those of you who have followed the development of this column, this month is as good as any to articulate those rules. So here they are.

Firstly, anything that appears in Retro Round-up will, in my eyes, be a 'quality' release. By that, I don't mean that it needs to be a physical tape or disk, but rather that it must be a release that its author has clearly put a great deal of time and effort into. Secondly, it must be a software release. I don't do hardware simply because I collect and own everything I review and software is my thing; I don't have the space to store hardware too. Thirdly, the Retro Round-up will only feature reviews of completed, by which I mean finished, software. That is simply because I have, over the years, been disappointed myself too many times by projects that were started, gained a lot of buzz and then were suddenly abandoned. Fourthly, the software appearing here must be available – whether that's via a website or an email address.

Now, with all of the above in mind, therefore, you'll remember that last month's article ended with a promise that this month's Retro Round-up would be taking a look at some of the newly rediscovered software for the Dragon 32. However, we won't be looking at it this month after all. So far, unfortunately, none of that software meets the very first condition, so it just doesn't feel right to include it.

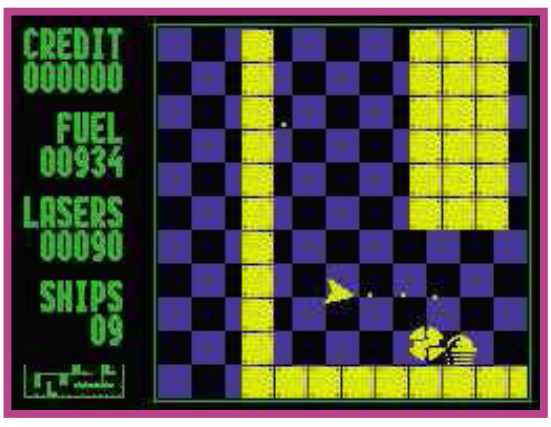
This raises a very interesting point about retro software per se. In the 30 years since Dragons and BBCs graced our homes, software has come a long way. In the early 80s, software programmers could get away with spending two hours writing a Basic *Pac-Man* game and flog it for £10 a pop. The archive sites have gathered up all of these clones and made them available for free – so the 'market' for them, if there ever was one, is simply saturated. Those who are interested in new games for such formats both want to see something different and something that reflects, in its production, what we've learned about game development in the interim period. 'Lazy' basic games just will not do. In fact, if you released one today, you would probably just get laughed at.

Now that's not to say that everything recently released for the Dragon is not good quality. It's more that this has been yet another bumper month for new releases, with Cronosoft leading the charge with three new Spectrum games, all available for less than the cost of a bus ticket. And with their quality level being superior, let's take a look at them now…





▲ *Another glamourous cover from Cronosoft – and you get two games for the price of one*



▲ *Blizzard's Rift is what happens when you cross a poor man's Elite with the classic Thrust*





Pursue Kuipers across the galaxy – but beware of the asteroids!

Blizzard's Rift

Blizzard's Rift is a new release for the Spectrum 128K, and it has been released as the main game on a double-sided cassette by Cronosoft. The flipside contains a second game, *Kuiper Pursuit*. Both games are somewhat similar in style and, as per most of Cronosoft's catalogue, are written by Jonathan Cauldwell.

Blizzard's Rift could be summed up as '*Elite* with the space-trading replaced with *Thrust*-style caverns' which is both a compliment and, regrettably, an admission as to its lack of originality.

You begin each game by paging through star charts and choosing a 'destination planet'. Confirming this engages your ion drive and pits you in a cockpit-based first-person shooter in deep space. You can bank anticlockwise and clockwise, climb and fire. Intermittent alien ships appear and must be manoeuvred into the centre of your cockpit view before you press the fire button. A stream of bullets then stream towards where you were aiming.

As you would expect from a craft journeying through space, scattered dots around the playing area provide the impression of movement. Curiously, though, these dots move slowly; in fact, I found myself thinking my craft was stationary and started looking for a non-existent accelerate control!

When journeying to your destination, note that it takes longer to travel to a distant planet than a local one. However long it takes, the game changes entirely on arrival and becomes a side-on *Thrust* challenge of craft control. You see, littering each planet's surface is an assortment of treasures, and each treasure can be collected by flying into it. However, the gun turrets firing at you, and the treacherous cavern walls that require traversing, make such planet-pillaging extremely difficult. It is presumably the caverns rather than the cockpit-dogfighting game that restrict *Blizzard* to the 128K Spectrum; each planet has its own unique layout, and the planet's proximity to your start position is in no way commensurate with its difficulty level.

> **This has been yet another bumper month for new releases**

The pace of the game and, as you pick your nemeses off, the satisfaction of them exploding into dust (more dots!) are good things about *Blizzard*. Unfortunately, these do not offset its frustrations. Firstly, even with the *Elite*-style ability to upgrade your ship, making gamers journey through a pretty dull deep-space adventure just to play *Thrust* is rather a dubious premise. Most players are hopeless at *Thrust* anyway – the finite angling and nudging of controls required seems them loopy in five minutes flat! Finally, if you consider that, when you crash in the *Thrust*-style game, you're returned all the way back to the planet's surface again (no matter how far you had progressed), it doesn't sound too good, does it?

Kuiper Pursuit

On then, to *Kuiper Pursuit*, and those of you of a certain age (Mine!) may remember the TV programme *Red Dwarf* and Commander Ace Rimmer, deep space adventurer extraordinaire, who announced each mission with the phrase 'Smoke me a kipper. I'll be back for breakfast.' *Kuiper Pursuit* has an early nod to Ace, with the on-board cockpit-computer scrolling 'Smoke me a Kuiper'.

The aim, as you might have gathered, is to shoot down enemy ships. However, *Kuiper*'s deep space is significantly more challenging, as it is peppered with flying asteroids. You must try to avoid these and shoot down as many kuipers as you can before your own seven shields run out. Your on-board computer spits out 'Shield Down' each time one is wiped out, and encouraging compliments like 'Bullseye! He's bought it!' when your bullets find their quarry.

Nice though this is, you actually miss the majority of these comments, because the game demands your unwavering attention. Avoiding a screen full of asteroids is hard enough to begin with,

but the game's dynamics are such that you are 'hit' by an asteroid if it reaches a certain size and is somewhere in the middle of the screen. Unlike in other deep space shoot-a-thons, this certain size is woefully small; an asteroid never even reaches the size that it obscures anything else at all. This can be rather confusing, as the computer can be ratcheting up the 'Shield Down' messages for a good while before you get the hang of exactly how this part of the game works. When you're hit, the action slows down so you can correct your position.

During the entire playing time of Kuiper, the Spectrum emits a rather piercing stream of white noise, which is only interrupted by the sound of your lasers firing off. Firing is the same dot-missile effect as in *Blizzard*, and you dive as well as climb here. However, there's no option to upgrade your firepower, and there's little 'hook' factor to *Kuiper Pursuit*. A typical bout lasts about two minutes, which will land you a place in the high score table too.

The only other point to make is that if you're a fan of Yerzmyey, the Spectrum music coder, *Kuiper Pursuit* contains a digitised musical intro by him.

It's easy to think that the 128K *Blizzard's Rift* is the main attraction of this compilation, with 48K *Kuiper Pursuit* just thrown in as a bonus game. However, that's not really the case. The two games were written years apart and as separate professional titles in their own right. For £2 a game, and considering the whole package comes on cassette with some splendid cover art, I really cannot criticise them too harshly. If you're a fan of deep space shooters, and have played *Elite* to death, then what are you waiting for? Visit **cronosoft.orgfree.com** now!

Morfix

One of the best archive sites for retro games is Stairway To Hell (**www.stairwaytohell.com**), which is maintained by the same team as **retrosoftware.co.uk**. It features a near-complete library of every game ever released for the BBC Micro. Over the years, it has also found more than a few hitherto-unreleased ones too. *Morfix*, written by Andrew Stanford, is one of these and is a monochrome graphic adventure that I suspect few have seen – a shame, because it's rather unique in style.

> **Farmer Jack is a very well put together title**

You take control of a blob, and your mission is to reach your girlfriend (another blob), situated in one of the many 'rooms'. You have only three controls: left, right and jump. When you want to pick up an item, you must move over it.

Scattered around the rooms are some shapes including a circle, square, star and figure eight. Movement of your blob involves rolling him, and contact with any of the shapes results in him morphing into that same shape (although his smiley face remains constant). You need to be a certain shape to get through the doors that correspond to that shape's outline. Mission one therefore is to make a map – so you can see, at a glance, what shape you need to be in which room. Otherwise, you'll waste lots of time trying to remember where each particular shape is located.

Mission two concerns the other items you'll find. Smaller items can be picked up and carried. Larger items are those that require you to hold a corresponding smaller item. When you do, they increase the 'percentage complete' in the top centre of the screen and allow you to make further progress. For example, taking the coin to the balloon machine will operate it. When it then releases a balloon you can climb on top of that balloon to reach a higher platform and a new room.

Finally, mission three is the obvious avoidance of the patrolling monsters that live in each room and are anxious to deplete one of your five lives.

Morfix isn't particularly big, and the solutions to its problems aren't particularly difficult. However, though I did manage to complete it on my eighth

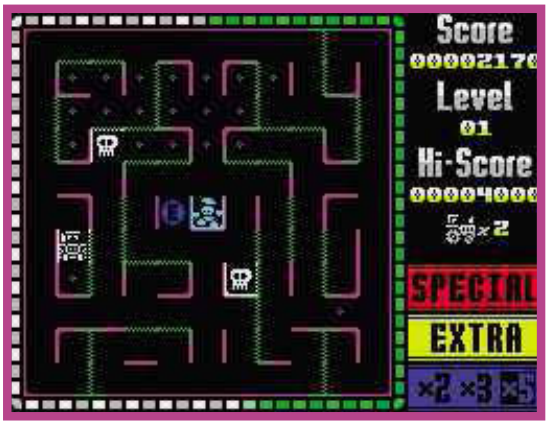




Morfix is an unreleased game by Andrew Stanford, which is available for free from Stairway To Hell



Cronosoft's new release of *Farmer Jack* features splendid music and graphics



The greatest foe in this game is not being in alignment with the maze walls!



go, it did require thought, planning and a fair dose of arcade skill. That certainly deserves a recommendation when it's completely free of charge. It can be downloaded from **goo.gl/5wBgWk** and seen in action at **youtu.be/Hz-v3hlhF8E**.

Retro Find Of The Month: Farmer Jack And The Hedge Monkeys

When I was a boy, I owned an Acorn Electron game called *Bumble Bee*, which was a twist on the *Pac-Man* formula. Your bee scurried around a maze avoiding spiders and clearing screen after screen of dots. The twist, however, was that the maze walls would rotate if your bee rammed into them, effectively making the maze fluid. Scattered around it were a bunch of spider-traps too, and you scored bonus points if you managed to lure the roaming spiders into one of them. I always assumed *Bumble Bee* was an original game, because there didn't seem to be any clones of the format for the Spectrum or Amstrad computers.

Now, many decades later, there's a very similar game for at least the Spectrum. *Farmer Jack And The Hedge Monkeys* is almost identical, replacing the bee with a tractor, dots with seeds and spiders with "ravers, hippies and hedge monkeys". It's a fast, frantic and frustrating version too with excellent graphics – and yet another musical masterpiece by Yerzmyey beating away in 128K mode.

The maze is of considerable size and you begin clearing it from its dead centre. Hippies also begin at the same position but appear one at a time and only when an on-screen countdown reaches zero hour. Needless to say, it's advisable to clear all seeds around the start position as quickly as possible. This will allow you to keep some space between you and them.

Some walls will rotate about their origin if you run into them; others, however, will not. Moveable and immoveable walls are coloured differently, although you do need sharp eyesight to determine this.

> **You take control of a blob and your mission is to reach your girlfriend**

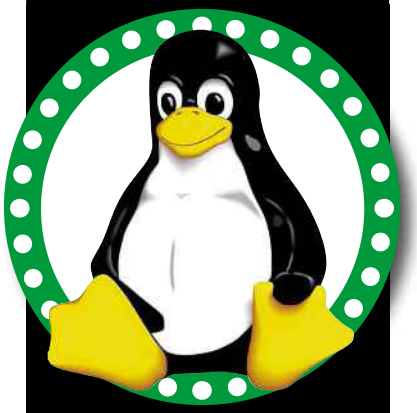
Overall, with its gorgeous opening screens, its selection of funky music and its colourful graphics, *Farmer Jack* is really a very well put together title indeed. That is, however, apart from one big issue which I should warn you may result entirely from my overfamiliarity with *Bumble Bee*. That big issue is this: your tractor can be moved left, right, up and down. However, if you release the control key, it stops. If you compare this behaviour with *Bumble Bee* or indeed *Pac-Man*, this behaviour is different. In those two games, you tap the control key and your character continues in that direction, bashing revolving walls out of the way if appropriate, until he hits a foe and dies or comes to a stop at the maze outer border. That is not so here.

Now while this seems like a little thing, it has a large effect on the frustration level of *Farmer Jack*. Your tractor must be 'in line' with the maze walls to navigate its way through them. If you stop in an unaligned position, your tractor simply won't move as you want it to, and in the second it takes to shift it about, an angry hippy may well collide with you, taking away one of your three lives.

I'm sure Cronosoft would argue that this game is not *Bumble Bee,* and the movement routine is a feature of what is a very addictive game. I would have to agree. But even if I wasn't a *Bumble Bee* aficionado, I would, I think, still find fault that you can be thwarted in making progress through the maze by being a few pixels too far left or right. Still, if you set that aside, *Farmer Jack* is an excellent clone of the old favourite and highly deserving of the title of Retro Find of the Month.

Rounding Up

X-Force (for the Commodore 64) has just been released, with pre-orders being fulfilled by Psytronik (**binaryzone.org/retrostore**) as you read this. The emulator version is also currently sitting in my inbox. Next issue therefore, we'll be taking a look at this, and a whole host of new releases from the same company. Until then, keep avoiding those hippies and shooting down those kuipers... **mm**



DirectX11 On Linux?

CodeWeavers and plenty of Wine

David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

I read a report the other day that CodeWeavers, the company that developed CrossOver to allow Windows software to run on Linux and Mac systems, is expecting to support DirectX 11 by early next year.

What this essentially means is that when support for DirectX 11 appears on Linux it'll only be a little while before Wine will be able to run DirectX 11 programs, which of course will be a huge catalogue of Windows-only games.

How effective the DirectX support will be, we're not sure. And whether or not you'll be able to run the latest games designed for Windows using DirectX 11 is yet another question that remains to be answered.

Wine is currently able to load up and run DirectX 9 games, but in all honesty I've only ever been able to get a handful working to a point where they're actually playable. Running something through it is all fine and well, but there are many different aspects to take into consideration. DirectX code is what keeps Windows games from being ported over to Linux – well that and the fact that gaming companies don't necessarily want to spend money porting to a system that's only used by a small population of the computing community.

Wine works well some of the time. But despite the growing support for programs and games from a Windows environment, I'm often left thinking that perhaps the focus should be on creating a more Windows-like driver set and designing a game purely for Linux as opposed to a masked API layer like in Wine.

Still, looking at it from a more positive viewpoint, if the backbone code is there to support DirectX 11 on Linux via Wine, then it could just be a matter of time before that code is written into the kernel by default, allowing a Windows game to run on Linux without the need to resort to a Wine setup or something else.

> **"Wine is perfectly fine for a lot of programs and games"**



Where Do You Stand?

As I said, Wine is perfectly fine for a lot of programs and games, but it's far from perfect. DirectX 11 support in Wine is a blessing and will naturally improve that compatibility list by a factor of a hundred or more.

But what I want to ask is this: do you think pumping all this effort into Wine DirectX 11 support is ultimately worth it, or should the community be looking to push developers and games publishers to provide a pure Linux version of the game?

Emulation (although Wine isn't regarded as an emulator of sorts these days) is something John Carmack of Oculus (formally id Software) has hinted will be the best direction for the Linux platform. If that's the case, then it's a little disappointing. While emulation, in whatever form it takes, is certainly good, it's not the same as the 'real' thing.

Still we'll wait patiently for what CodeWeavers has to offer, and when support for DirectX 11 finally appears we'll certainly be testing the socks off it.

< Will Wine support for DirectX 11 kickstart a new gaming Linux era?

Think Positive

As a new update to OS X looms into view, Craig Grannell puts away his cynicism for a bit and looks on the bright side

OS X El Capitan has a stupid name and, in the latest beta, a baffling ongoing disregard for people with vestibular disorders. It also doesn't have any real standout features and– *RECORD SCRATCH*

What's that? It might be a good idea to be positive once in a while, to showcase to Mac Mart readers that OS X isn't just an OS you want to burn to DVD (since it's no longer available on DVD) and smash against the wall, because it irritates you so much? You say it's time to talk about the good bits? Well, okay…

And to be fair, there is some goodness lurking at the heart of El Capitan, so here are my five favourite things so far:

1. Notes

Yes, it turns out my number one reason for looking forward to Apple's next OS revision is the most boring of apps, Notes. But that's primarily because the revamp looks really good. Rather than a rubbish notebook for collecting only text, Notes will finally enable you to import photos, videos and great-looking web links and map locations. Embedded checklists are a thing too, as is an attachments browser to see all your visually oriented clippings. And if you're thinking this all sounds like a cut-down version of Evernote, you're not wrong, but that sounds pretty good to me, not least given Evernote's tendency of late towards complexity and clutter. My aging brain could do with something simpler.

2. Safari

No, not because you'll soon be able to pin sites to the tab bar, to keep them handy. (Wasn't that what the Top Sites view was supposed to be for?) And not for being able to 'share web video without sharing your whole screen'. Instead, the Safari revolution I'm eager to enjoy is the means to mute audio from specific tabs. Every site that auto-plays video, I'm looking at you – and knowing you will soon no longer be annoying me. Mwahaha!

3. Spotlight

Spotlight gets a bad rap – sometimes deservedly – from people. It tends to be sluggish and a bit stupid. But OS X Yosemite started adding a little intelligence, and now El Cap's version will add more online search sources, including web video. (This is Apple again thumbing its nose at Google, clearly.) A bigger change, perhaps: Apple starting to integrate natural-language input into search terms. That could be a game-changer.

4. Split View

Yeah, yeah. Microsoft from 2008 called and wants its feature back. But imitation is the sincerest form of flattery. Or something. In reality, I've no idea how much I'll use Apple's new two-up app view, which is designed to work in full-screen. I'm a total Moom fanboy, and can't imagine that utility being dumped for Apple's new shiny toy. But in tandem with the revamped Mission Control, Split View *does* look very elegant…

5. An Emphasis On Performance

Since it's fairly unlikely Micro Mart's petty cash tin will stretch to buying me a brand-new iMac, in order to write this column, my existing setup will have to last a while longer. On that basis, it's good to see Apple adding a bit of Snow Leopard to El Cap, in the sense the underlying guts will improve; this should speed up everyday tasks, such as app switching, opening PDFs and accessing Mail. I can't imagine it'll make me feel like I have a brand new Mac, but at least post-install it won't feel like I suddenly have a much older one.

(And now we're done, I reserve the right to doubly grumble in a fortnight's time.)



OS X El Capitan. Stupid name. Perfectly sensible new features

Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find **Craig** on Twitter at **@craiggrannell**



Big Sound, Tiny Price

Ian McGurren finds out how the synthesisers of the past are re-emerging on the iPad

Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

I've been a fan of things that go beep and boop since the BBC Radiophonic Workshop's obscure, abstract noodlings soundtracked many of my favourite childhood TV programs and Kraftwerk ruled the music centre. I wanted to know what made these otherworldly sounds. One day my dad brought home an album by Tomita (the Japanese Walter Carlos) filled with these sounds, an album that also showed on the back the man himself operating what looked like a telephone exchange or valve computer. This was in fact a Moog modular synthesiser, and it's since then that I have coveted the very unique sounds they make.

Sadly, for me to buy the real deal would need a lottery win, as many of these vintage instruments are commanding prices on the second-hand market in the thousands of pounds. But thanks to the power of modern computers – and tablets – these synths have found themselves virtualised in code, giving non-millionaires like me the chance to make those sounds of the past to our heart's content. Here are a few of the best:

Arturia iMini

Real: £3,500 Virtual £7.99

While French software developer Arturia has a recreation of the full Moog modular running on Mac and PC, so far it's only brought its more portable spin-off, the Minimoog, to the iPad. Actually, 'only' is unfair, as the Mini is one of the most sought after synths around and has appeared on thousands of records. Arturia's recreation is probably 85% there. It evokes the look and sound exceptionally well, certainly enough to hook up a keyboard via USB and jam away happily. The Moog filter sounds pretty creamy for an emulation, and although a 45-year-old machine made of actual electronics may still have the edge in sound, the iMini's price of £7.99 is probably around 500 times less than the real deal, plus it plays more than one note at a time.



Korg Polysix

Real: £1,200 Virtual: £29.95

Not the most successful when launched, the Polysix is – as the name suggests – was polyphonic on release, meaning it played more than one note at a time (six here). Sadly the hardware was paired with a battery that ate away at the circuit board so the sound and the dearth of working units has pushed a Polysix price up to over £1,000. While Korg's emulation may be expensive for an app, it's pence for a Polysix. Korg actually recreated four of its biggest selling synths a few years ago for Mac and PC, and this is essentially the same code on a new platform. Like those versions, it sounds great, ever evocative of that woozy Boards of Canada / 70s TV idents analogue tone those of a certain age will identify with. Like the iMini, it lacks a tiny something, like an MP3 does compared to a record, but the interface is easy to use, and in a busy mix you'd be hard pressed to tell the difference.

Beep Street Sunrizer

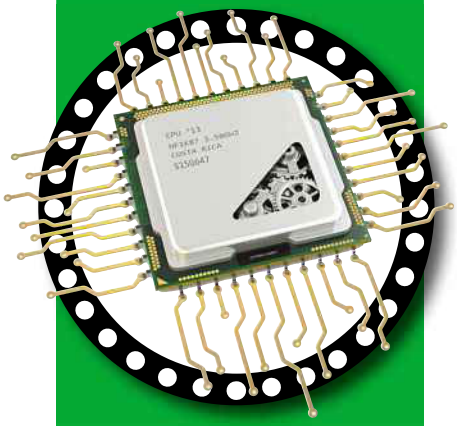
Real: £500 Virtual: £7.99

Unlike the other two, this is not only an unofficial version of a synth, the unit it's based on isn't vintage like the others and isn't even analogue. Sunrizer is a virtual recreation of what was one of the first virtual analogue synthesisers, Roland's JP8000. However, odd as the concept may seem, the JP8000 is another highly coveted synth, though somewhat more niche, as it's one of the main synths in the buzzy, big room trance sound. Its secret weapon is the Supersaw, essentially a beefed-up version of the standard saw wave building block, and it's that same weapon, layout and sound that's present in the Sunrizer. For all intents and purposes, it is a JP8000 by any other name. But how does it sound? It's not one of the best selling iOS synths for nothing, and it sounds incredible. Not tied to an authentic recreation like the iMini or iPolysix, Sunrizer has a liquid, modern sound that's vast and exciting, though sometimes it can be a bit too big. Editing is still a cinch, the panel is laid out in the logical manner, and there are extras such as chord memories and arpeggiators to stimulate the creative juices. For the price, it's a bit of a steal.

All three synths are playable on their screens, some offering an X-Y type pad to interact with them as an alternative, but all are best played with a proper keyboard. You can hook up a USB one to an iPad's camera connection lead as long as the keyboard is class-compliant. Even if you don't fancy making 'music', frankly these are just fun to play around with and get some crazy, unexpected noises from – noises like you may have heard the BBC Radiophonic Workshop making all those years ago, only for a lot less pain and cost!

The Beat Goes On Eventually

Pity poor Andrew Unsworth. Even his PC tells him to stick to his day job



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Having finally found some semblance of work-life balance after many years of long hours and London commutes, I've revisited old hobbies, those pastimes and activities that remind us who we really are, who we were and what makes us happy.

For me, one of those pastimes is convincing myself I can play the keyboard and program a drum machine. Nothing makes me happier than making my own beats, laying mismatched strings and piano over them and playing the resulting cacophony alongside other people's music or, even worse, scratching over the top of them. Of course, I'm not alone in this. Many people privately indulge a passion for noise pollution, and even though they must know the results pale in comparison to the polished efforts of studio-recorded musical legends, they pursue it anyway, purely because of the enjoyment they get out of it. Some bedroom musos seemingly strangle kittens and hear Hendrix; I slap rubber pads like a demented berserker playing whack-a-mole and hear John Bonham.

Sadly for me, but perhaps fortunately for my neighbours, my recent attempt to make some noise for myself was brought to a relatively short end due to an amnesiac licence manager. After setting up a Native Instruments Maschine sampler-cum-drum machine and a Korg MicroKey 61, I had to wait ages while Maschine 2 checked the files in my installation. Later, when I tried to launch the Korg M1 emulator program that comes with the MicroKey 61 the licence manager prompted me to register the licence code, which is something I did around six months ago and never expected to do again. This might seem like a minor hurdle to pass, but it means trawling through emails and the Korg website to re-register something I've already registered. When I want to 'make' music I want to do so right there and then; I don't want to argue with software to do something I should be able to do without impediment. In this instance I slapped pads on the Maschine instead, but I'd intended to spend a hot summer's evening playing the piano riff on The Prodigy's 'Your Love' badly, probably using the wrong chords. Sure, I can and did use the MicroKey 61 to play instruments within Maschine 2, but it isn't and wasn't the same.

It's this kind of thing that really shows up the disadvantages of using a computer for occasional creative pursuits. On one hand, computers open up a whole new world of creative freedom, with the ability to play classic instruments that are emulated to such a high degree that most people can't tell the difference between the computer-generated version and the real thing. On the other hand, computers can lack the switch-on-and-play immediacy of proper hardware synths and drum machines.

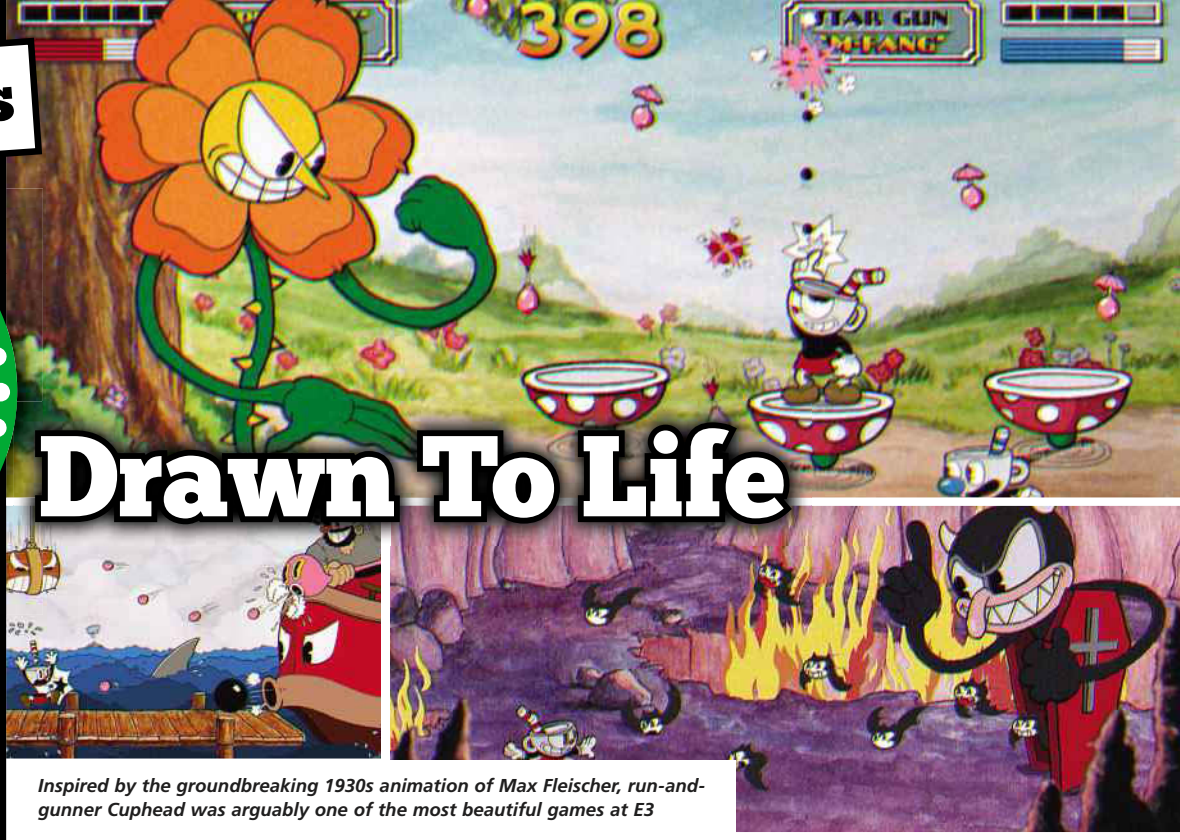
It's for this reason that many bedroom musos are gravitating towards items such as Roland's Aira series, products that interface well with a computer but can also be played away from them too, giving users the best of both worlds. I suppose the trick is to maintain a healthy work-life balance, practise often and keep on top of updates and so on. Then again, maybe my computer really is telling me to stick to my day job.



The Korg M1 piano patch was the defining sound of the rave era, and the software recreation is excellent value, but sometimes I'd prefer the real thing



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*



Drawn To Life

Inspired by the groundbreaking 1930s animation of Max Fleischer, run-and-gunner Cuphead was arguably one of the most beautiful games at E3

This week, Ryan checks out the incredible hand-drawn animation in the indie shooter Cuphead, and takes a first look at Ubisoft's Ghost Recon: Wildlands...

Plug & Play

Big hitters like *Doom*, *Fallout 4* and *Mass Effect Andromeda* (announced with a blink-and-you'll-miss-it-trailer) received much of the attention at June's E3, but the event was also packed full of promising indie games. In fact, among all the high-res textures and moody lighting effects of E3's big-budget titles, it was a little game called *Cuphead* that almost stole the show with its spectacular 2D character design.

Cuphead looks to the 80s for its run-and-gun action, which recalls such retro arcade machines as *Contra* and *Metal Slug*. It reaches even further back for its visuals, however, which are an immaculately crafted homage to the work of 1930s animator Max Fleischer – an animation pioneer whose studio brought Betty Boop, Popeye and Superman to the screen. Fleischer's work was subversive, surreal and downright groundbreaking, and *Cuphead* takes its febrile atmosphere and applies it to a string of intense and very strange boss fights where giant frogs with boxing gloves roll around the screen; a colossal carrot tries to kill the player with its psionic third eye and a ghost defends itself by throwing its own eyeballs.

It's the kind of game that looks pretty and colourful in still images, but really has to be seen in motion – for the design and animation team, Chad and Jared Moldenhaur, this is a true labour of love. Work first began on *Cuphead* back in 2010, and in the years since, the Canadian brothers have been painstakingly drawing each cel and watercolour background using traditional techniques – the use of Photoshop to colour in the scanned cels being one of the few concessions to modernity.

In total, there will be 30 bosses to fight in Cuphead, with more planned as DLC after its launch. For some, the game's focus on boss battles (inspired, perhaps, by the cult Sega Mega Drive title *Alien Soldier*) might prove to be an acquired taste, particularly when coupled to an extreme difficulty level akin to *Super Meat Boy*. Far from being a repetitive grind, though, *Cuphead* seems to revel in throwing something new at the player at every stage. Enemies constantly change in unexpected ways, while on-foot levels are interspersed with *Gradius*-like scrolling shooter sections. Its two-player co-op mode should add to the fun, while a decidedly modern countering system – where avoiding enemy fire unlocks a powerful counterattack - should even the odds at least a little.

Stunning to look at and infused with darkly surreal humour, *Cuphead* (due in 2016) looks like the kind of game we'll keep playing just to see what wild delights the next level will bring.

Online

Gaming's biggest publishers announce so many games at E3 that we almost wonder whether they might be doing themselves a bit of a disservice. Take Ubisoft, for example; it had no fewer than 11 titles to show off this year, ranging from those we've known about for some time (*Assassin's Creed Syndicate*, *Rainbow Six Siege*), to unexpected sequels (*South Park: The Fractured But Whole*) to entirely new games like *Ghost Recon: Wildlands*.

On paper, *Wildlands* sounds like an odd move from Ubisoft, since it sounds very much like another major game it has





The long-running Ghost Recon series could get a huge boost with Wildlands, a tactical shooter that takes the franchise into new open-world territory

in the works – *Tom Clancy's The Division*. Both games are shooters with online multiplayer, co-op missions and a big open world. What separates *Wildlands*, it seems, is its setting and its depth of player choice. Where *The Division* takes place in a city riddled with disease, *Wildlands* is set among the dramatic mountains of Bolivia. As a member of an elite American operations unit, it's your job to combat the country's vicious drug barons – disrupting their supply lines, locating and rescuing informants and taking out the cartels' most prominent members.

A far more ambitious game than the earlier *Ghost Recon* titles, *Wildlands* sets the potentially bewildering challenge of coordinating tactics on a vast play area. Teams of up to four players can be located miles apart on the map, each engaged in their own piece of a wider mission – one might be acting as a look-out high up on a hill, another might be sneaking around a drug lord's base of operations, while still another could be waiting in the wings with an escape vehicle.

Applying *Ghost Recon* tactics to an open world-style format is a bold new approach, and the gameplay footage shown off at E3 hints at a technically impressive game with a variety of things to do. A series often eclipsed by the more famous names in Ubisoft's expansive *Tom Clancy* series - *Rainbow Six* and *Splinter Cell*, for example – *Ghost Recon* could be completely reinvigorated if Ubisoft Paris' *Wildlands* can deliver on its promise.

Certainly, its mix of stealth, shooting, teamwork and tactics, mixed with the variety of its South American setting, look more inspiring than the slightly dreary-looking grey city streets of The Division.

Ghost Recon: Wildlands doesn't have a release date yet, but looking at Ubisoft's track record with its other open-world games, we're guessing it won't be out until the end of 2016 at the very earliest. Here's hoping it's worth the wait.

Incoming

When you think about it, the *Mad Max* movie franchise is the perfect fodder for its own open-world action game, with its dusty, violent post-apocalyptic landscape offering all kinds of possibilities for vehicular mayhem and hand-to-hand combat. By the same token, Avalanche Studios is surely the perfect developer to take on such a game, given that it's responsible for the absurdly over-the-top sandbox series, *Just Cause*.

The studio's *Mad Max* game looks like the ultimate Max Rockatansky simulator from what we've seen so far; you get to roam the landscape in a ramshackle ute, hunting for fuel, water and spare parts to keep it running. You'll encounter numerous bandits and warlords, most of whom will try to kill you with their own spiky, armoured vehicles. There are on-foot sections, shooting and a smattering of RPG elements, but Avalanche estimates that about 50% of the game will consist of vehicular combat.

Games based on movies don't exactly have a glowing reputation, of course, but then, Avalanche hasn't attempted to make a typical licensed game out of *Mad Max*. Rather than follow the events of the movies, *Mad Max* aims to create its own experience that happens to take place in the series' bleakly exotic universe. And given that you can harpoon an enemy and drag them through the desert from the back of your car, it seems safe to say that Avalanche has brought some of that much-loved *Just Cause* games' anarchy to *Mad Max,* too. We'll know what else it's got up its sleeve come September 1st.





Avalanche Studios brings its talent for sandbox action to the Mad Max universe, where a wealth of vehicular mayhem awaits

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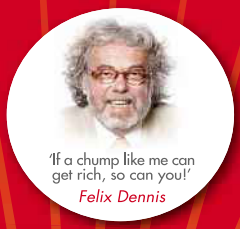
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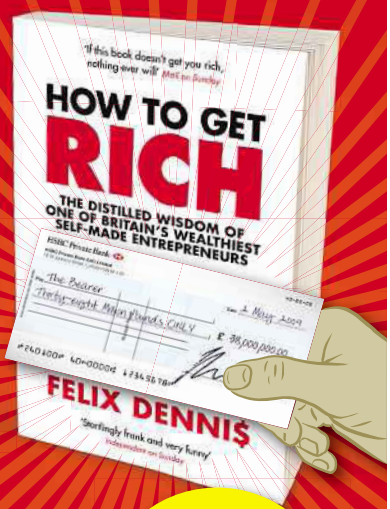


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HP 4GB memory Microserver with two hard disc drives. £110. One with Linux MINT. Other with Linux FreeNAS. This will also run Windows 7 and Windows Server or Home Server. (Win 8 I've not tried it) Two spare HD slots with appropriate caddies. Slot for your SATA DVD drive also, (or use external usb or DVD drive if needed. four usb sockets on front, two on rear. VGA, network, power sockets on rear. Supplied in original HP box with CD and leaflets etc. Collect from Harrogate, North Yorks, or posted via Hermes for £12 (or less if I can do it cheaper). Cash on inspection and collection (Highlands and Islands might obviously cost more to be delivered).
Tel: (01423) 872045
Email: it_central@ntlworld.com

400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

EPSON PRINTERS T715 12 multipack F.O.C. to good home, just pay postage £2.50. (Tesco equivalent original cartridges £120 current special offer!) Perfect crisp printing etc.
Tel: Pete Dew: (07526) 988594

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Tel: Pete Dew (07526) 988594

Apple Mac G4 Tower. 400MHZ CPU, 640MB RAM, 2xHardDrive (40&20GB). DVD & ZIP. OSX v10.3 Panther+OS9. NO KEYBOARD OR MOUSE. £25 ono Buyer collects
Tel: (07941) 254296 Email: jasonnd@hotmail.com

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Trying to breathe life back into an old machine? Why not submit a wanted ad and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga

motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.

Tel: Bill (07742) 061569 or (02641) 769503.

WANTED: Fractal Design Define XL full tower case. R1 (original version) in black.
Tel: (01670) 860146
Email: mm@tectron.co.uk

WANTED: Working Dot Matrix Printer in Good Condition. Thanks!
Email: printer.20.odaily@spamgourmet.com

WANTED: Acorn computer either an A5000 or A7000. Also book on teaching yourself binary.
Tel: (07817) 861011
Email: Johnhaviland73@gmail.com

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Do you have old software that you simply don't use? Why not advertise with us and see if anyone else can make use of it – you may well be surprised to find that someone is looking for it!

Adobe Photoshop Elements and Premiere Elements 12 Full Version - Windows/Mac. Original Boxed CD with unused product key. £47.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

PCB design software 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99
Tel: Nigel Wright (07967) 527693
Email: cresswellavenue@talktalk.net

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com
Microsoft Office 2013. Original Software only £100.
Tel: Gordon (01314) 660205
E-mail: scobieg09@gmail.com

Windows 7 Ultimate 32-bit version. NEW software and license (certificate of authenticity) 100% genuine and unopened software .ONLY £45 including P&P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

Sim City 2000. Boxed and original. Classic gaming. £15.
Tel: Gordon (01314) 660205 E-mail: scobieg09@gmail.com

Windows 2000 Professional. NEW software and license (certificate of authenticity) 100% genuine and unopened software. ONLY £15 including P & P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows Vista Business. New and sealed. software and license (certificate of authenticity). 100% genuine and unopened. (Dell branded but will install on any machine) ONLY £15 including P&P
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows 7 Home Premium 32 bit versions. NEW software and license (certificate of authenticity) 100% genuine and unopened software .ONLY £35 including P & P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows 7 ULTIMATE 32 Bit and 64-bit DVD disks incl. SP1 This is my "Get Genuine Kit" from Microsoft not OEM. New install or legalise your copy with full Product Key. only £50 incl. reg. post
Email: Dave ochdgh@aol.com

Nuance Omnipage 18. OCR for Windows 8, 7, Vista or XP, Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

SOFTWARE WANTED

Wanted: I have a BCL 2.4g Wirless Gaming Mouse, Model: RF0P77 (3v 7ma) but no Drivers. Can someone help with a copy of the Original Drivers for this Wireless Mouse>??
Email: Cliff Evans
cliffordevans603@btinternet.com

Wanted: Driver disc for Toshiba L30-11D PSL33E laptop. Laptop useless without drivers but only worth £40, so cannot pay a lot.
Tel: John Udall (01384) 824494
Email: john.udall@blueyonder.co.uk

Wanted: Windows XP SP2 or Windows 7. Also a boot disc for Toshiba satellite L40-18Z.
Tel: Mr Cranney (07948) 927384
Email: mcrnny1932@gmail. com

Wanted: Windows 98 CD ROM with boot disk instruction manual and serial number. included.
Tel: Craig (07867) 930265 or (0191) 2093677 Email: craigtin44@hotmail.com

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Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Caught Mapping

I'm hoping you can help me with a real puzzle. Three days ago a new drive appeared in Computer on my Windows 7 Pro 64-bit machine. As you can see from the attached screenshot it is listed as Drive A, with the same capacity as Drive C, which is a 500GB SSD; however, the folder on it are very similar to those on Drive C, but not identical, although the capacities are the same.

All I know is that Drive A hasn't been used on computers since the days of the floppy drive, so I'd like to know why has it suddenly appeared on my computer, and what should I do about it? I imagine that simply deleting or formatting it would affect my real Drive C (though I don't know why), but I'm not sure where to go from here. I really value your expertise, and would be grateful for your advice.

James

Seeing a whole new 500GB drive appear in Computer out of nowhere is certainly enough to make you wonder, but I believe the cause of this (and, forunately, the solution) should be fairly simple. First a warning, though, don't delete anything or format, as this could be real data you really don't want to lose.

I suspect your C drive, or at least the Temp folder on the C drive has been mapped to a drive letter, which now shows up in Computer. You can easily check to see if this is the case in a couple of ways.

First, to ensure the A drive is not an actual physical drive (which it shouldn't be if you've not added a new volume or partitioned another), right-click Computer and go into Manage. Click on Disk Management and look through the list of drives currently installed in your PC. You should see all of your real drives and partitions, but drive A should be absent, as it's not an actual volume.

Next, press Windows+R and in the text box type 'cmd' and press Return. At the command prompt, type 'subst' and press Return. This will show you a list of drive paths that have been associated with a drive letter, in your case, A. If this is true, you may see a result that looks similar to 'A:\: => C:\Users\USER\AppData\Local\Temp' (USER will be your user name).

Assuming you have a new drive letter mapping, you can easily remove this by typing

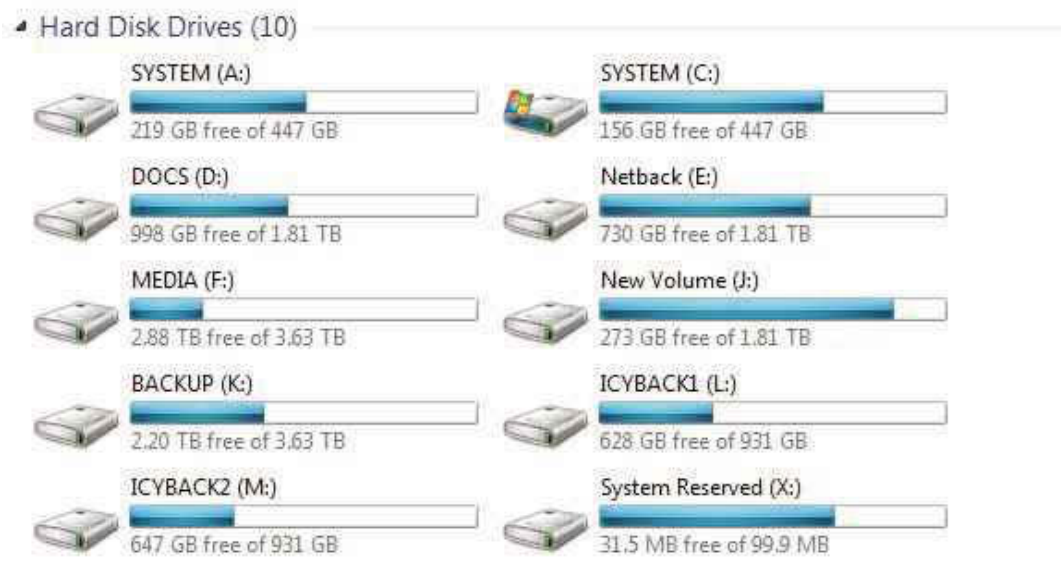
C:\subst a: /d

at the command prompt. This will remove the new drive letter mapping, and it should vanish from Explorer.

I should also clarify the difference between the subst command and actual drive mapping. Mapping a drive to a letter is a different function, and allows you to map a network drive to a letter on your system. Subst is different in that it simply assigns a drive letter to an existing file path on your system.

*Once you've removed the drive letter, your next step is to figure out why it appeared in the first place. It's not easy to set up a new drive path like this, so I don't believe it's been done by accident. With this in mind, I'd have a good think and check the programs that have been installed recently. It's likely that a program has made changes to your system without you knowing. You could even have a virus or other malware. Try looking through your startup (type 'msconfig' into the run box) for any new or unknown entries that look suspect. Also, run virus and malware scanners, and if you need more information on startup routines, download and use Autoruns (**bit.ly/1zJJKYU**). This will give you much more information that Windows' built-in startup tool.*

If a phantom drive should suddenly appear in Explorer, it may simply be a drive letter mapping, not a real drive



Firewall Favouritism

I have a Samsung Laptop Model NP300E7A with a Core i5, 8GB and running Windows 7 Home Premium. I use this when I am in Spain in the winter and have been able to access wi-fi in all the Spanish libraries with no trouble at all. Back home in my local library in West Yorkshire, however, I cannot log on to their wi-fi unless I change the TinyWall to allow outgoing. Why the discrepancy?

Also, when using my laptop when visiting friends, I can connect to most different wi-fi broadband set ups except one or two, these I can only use if I turn the firewall off. Why?

Any ideas or advise would be much appreciated (stops tearing my hair out).

Joyce

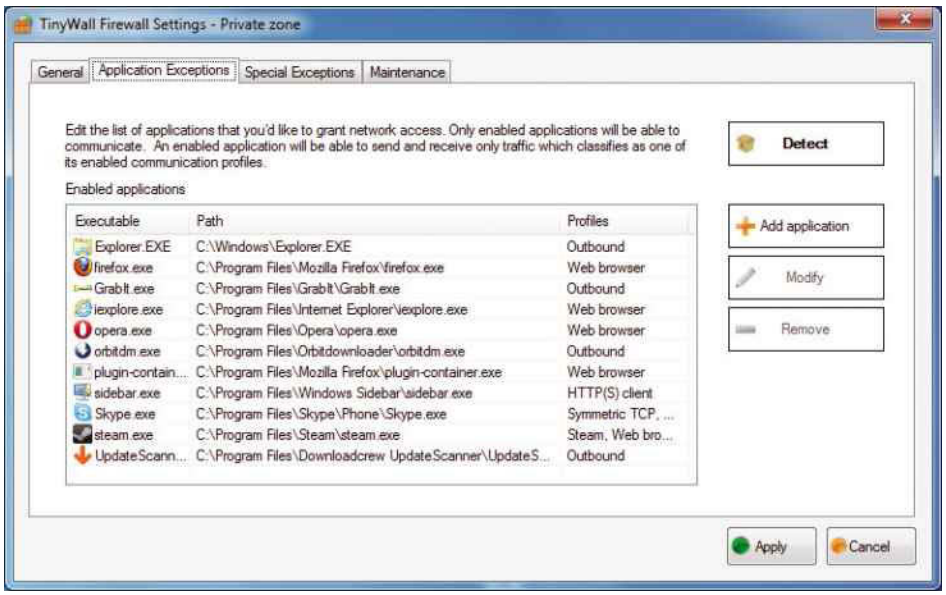
The likely cause of your issue here is simply down to the different types of router/access points and settings used for the various different wi-fi connections and their impact on your chosen firewall. As you can access the wi-fi when the firewall is set to allow outgoing, it's clearly some form of issue with the software, so it would be best to start there.

You can usually set up rules within firewalls to allow specific programs access to the Internet, so you could do this, which would mean you'd not have to manually change things every time you wish to use such a connections.

Alternatively, it may be prudent to try another firewall application, or even remove the program and use Windows' own firewall. TinyWall is a decent program, but it's also very simple, and you may be able to find an alternative program that will work better for you. ZoneAlarm is probably the most popular free firewall, and there are other options like Comodo Firewall, and Ashampoo Firewall Free.

I'd give one of these a go and see if they make any difference. Should one of them work for a wi-fi connection you've had problems with, it's likely the other network connections will also function correctly.

Most software firewalls, including TinyWall can use access rules to govern incoming and outgoing access



Riddle Me This

I've recently bought B*atman: Arkham Knight* for my PC, which is a very powerful system, and has specification higher than those recommend for the game. I installed the game and played it for a couple of hours, and eventually I started to witness all sorts of stuttering, frame rate drops, and even hard crashes (the whole PC locked up and had to be forcibly reset).

I understand PC games have issues, but the problems I'm now experiencing are just ridiculous, and many. Do you have any suggestions about this?

Craig

I'm assuming you sent in your letter before the furore kicked off regarding the game, Craig. The problems with Batman: Arkham Knight on PC have been extreme, so much so Rocksteady and WB have removed the game from Steam, and some high street outlets have even taken it off shelves.

*Rocksteady and the PC development team that worked on the port are working to fix the myriad of problems with the game. At the time or writing this response, a patch has been released that addresses some issues, but the game is still far from being considered stable (**bit.ly/1dq6PFo**).*

You're certainly not alone in this, Craig, so all I can suggest you do right now is stand by while the game is fixed, or – should you be sufficiently annoyed – get yourself a refund (which you can now do through Steam). It would appear that the console versions all work fine if you're keen to play it right now.

Arkham Knight may be a great game, but on PC it's currently unplayable for many



ASK JASON



Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

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Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Legacy Lunacy

It all started when I planned to give my old Sony laptop a boost by fitting an SSD. I had to give up on that, as the BIOS didn't have an AHCI option and Windows therefore wouldn't support TRIM.

So I've bought a newer, second-hand Acer, but this has a UEFI, not a BIOS. I want to wipe the supplied Windows 8.1 and put on Windows 7 (which I much prefer), but as this won't run on a UEFI, it'll be necessary to switch to the laptop's 'UEFI Legacy' mode (effectively a BIOS). But will TRIM work with that? Talk about two steps forward and one step back!

David Edwards, TalkTalk

TRIM takes care of every SSD's curse – blank-space fragmentation. As you say, Dave, it normally only works if an SSD's running in SATA/AHCI mode. If it's running in IDE/legacy mode, it's pretty much game over. Big-brand manufacturers do so love to cripple their BIOSes, but the lack of a SATA/AHCI mode on older systems was a serious oversight.

TRIM isn't specific to SATA/AHCI mode, though. It's actually part of the ATA/ATAPI-8 specification and applies equally to IDE/legacy mode. For example, some SSDs are actually IDE drives, and there's no technical reason why TRIM won't work. Sadly, however, Windows only issues the TRIM command to a drive when 'msahci.sys', the Windows AHCI driver, is in play. Clearly it won't be when an SSD's running in IDE/legacy mode. It's an artificial limitation, one that shouldn't exist.

While interesting, all these are all moot points anyway. You see, Windows 7 will install under a UEFI, though there are cavets to that. For a start, only 64-bit Windows 7 is a goer, it's true – but, more than likely, that's what you've got. Installation is mostly the same as it ever was, but here's an overview that mentions a few potential pitfalls: ***goo.gl/shwlhd****.*

> **"Manufacturers do so love to cripple their BIOSes"**

If you come unstuck and do have to enforce Acer's 'UEFI Legacy' mode, this shouldn't affect TRIM anyway. The legacy aspect there is unrelated to the legacy aspect of IDE/legacy mode you see.

I suppose it's possible Acer may have elected to make SATA/AHCI only available under the proper UEFI, but that would be utterly stupid and I can't imagine why it would choose that path. It wouldn't, however, be the first time I've been surprised by the decisions of a technology company, though. Best of luck.

▼ UEFIs sure do look pretty, but like a lot of pretty things, there are often problems hidden beneath the nice surface



More Legacy Lunacy

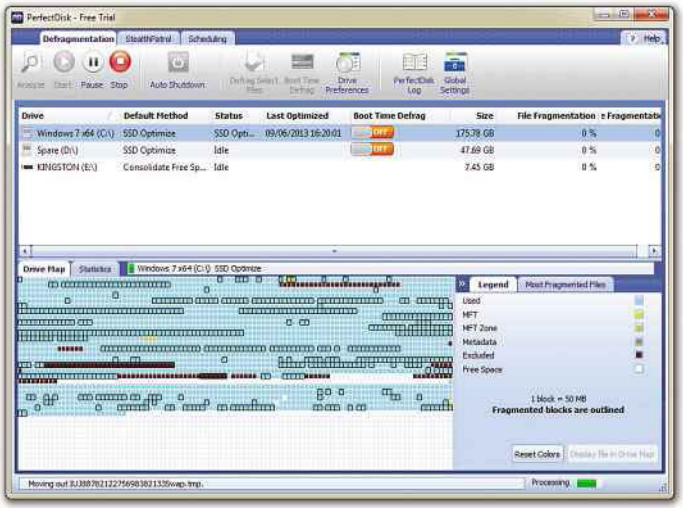
Whilst we're on the subject of SSDs and TRIM, I reckon it's worthwhile going over some possibilities when SATA/AHCI mode isn't an option, but the user's stuck with the machine. For example, Dave was able to replace his Sony laptop, but my ancient Asus laptop (being used to write this column) needs to earn its keep for a while longer yet.

Now, in the absence of TRIM, the vital role of garbage collection – which is what TRIM does – should be handled by the SSD itself. The SSD's own optimisations should kick in (they'll do some work even when TRIM's active). That's the theory. But with my 240GB Kingston HyperX 3K, that simply doesn't happen. Every six months or so I have to wipe the Asus clean and reinstall Windows. The impact of blank-space fragmentation is so catastrophic that the SSD becomes as slow as a 1.44MB floppy.

One tool doing the rounds is ForceTrim. As the name suggests, this forces Windows to issue the TRIM command in situations where it otherwise wouldn't. It merely requires that TRIM is already enabled, and it's enabled by default in any Windows version that supports it (Vista onwards) – regardless of whether an SSD's present. Some users report that ForceTrim works well; others, like me, report that it achieves absolutely nothing. Give it a go, though, dear readers. More information, plus the download link, can be found at ***goo.gl/237sHS****.*

*Another option is to use something like PerfectDisk Pro (****goo.gl/cck93j****). Amongst other things, this performs an SSD-optimised defrag. It leaves files alone and concentrates on blank space. I've witnessed fabulous performance boosts with this, especially after two or three passes. PerfectDisk Pro costs £24.58 (for a three-user licence), but never mind about that: there's a fully functioning 30-day trial. Use that to get you out of trouble and worry about what to do further down the line when the time comes..*

PerfectDisk could get you out of bother if your SSD is struggling to fend off an attack from its worst enemy: blank-space fragmentation



Trail Fail?

Mostly I use a laptop, but for my new home office I've decided to buy a dedicated tower. Initially I was going to get the Lenovo E50, available for £119.99 (**goo.gl/vTjBDl**). The specs are shown below.

- **CPU:** Pentium J2900 (2.41GHz, quad-core)
- **RAM:** 4GB DDR3-1600
- **HDD:** 500GB SATA III
- **ODD:** DVD rewriter
- **OS:** Windows 8.1 64-bit (free upgrade to Windows 10)

It was pointed out to me by a colleague, though, that the Pentium J2900 is a mobile chip, soldered to the motherboard. As I might want to upgrade later, I've therefore now opted for the Zoostorm 7873-1200, which is similar but has a Celeron 1037U (1.8GHz, dual-core), no keyboard or mouse, and no OS. This one's £149.99 (**goo.gl/lfg3k4**).

However, my colleague now tells me that the Celeron will also probably be soldered on. Is this true? I thought it was a standard desktop chip. If the chip can't be replaced, I'll cancel the order, especially as the price premium on the Zoostorm then looks unjustified.

A. Anderson, Gmail

The Pentium J2900 is really one of Intel's new Atoms (Bay Trail), designed for Mini-ITX motherboards, Ultrabooks, and even tablets (though its 10W TDP would make them pretty power-hungry tablets). It's a BGA chip, which means it's soldered.

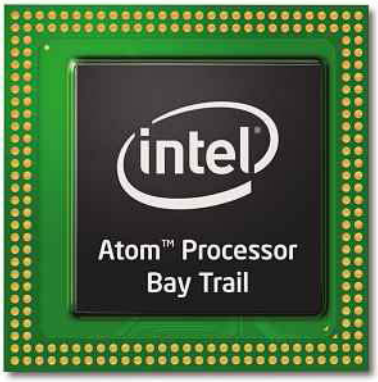
Sad to say, the Celeron 1037U is also BGA and also soldered. Your colleague's right. It's a laptop chip (the TDP is 17W). There's no doubt about it – you wouldn't be able to swap it later for something beefier. Having said that, the Zoostorm's motherboard is almost certainly a standard Mini-ITX or microATX affair, so you'd have the option of replacing it for a board with a socket. You'd then be able to sell the original board, complete with chip, on eBay, recouping some of your outlay.

Don't make the error of believing the Celeron is inferior to the Pentium. Yes, it's only got two cores, not four. Yes, the base clock is only 1.8GHz, not 2.41GHz. But the 1037U is a full-fat Ivy Bridge – a slightly crippled Core i3. It's much more efficient than anything coming out of the Atom stable. Cast your eyes over these benchmark numbers: ***goo.gl/IA0fEk***. They put the Celeron 24% ahead in general usage, and my own experience backs this up.

I expect you'd find the Celeron perfectly adequate (maybe the J2900, too). The desire to upgrade would probably vanish unless you started using Photoshop or something needing similar horsepower. Word, Excel, email, web browsing, accounting – for years now even very low-end PCs have had the chops to handle all of that almost at idle.

You're right that the Zoostorm looks expensive compared to the Lenovo – especially if you don't already have an OS for it – but I wouldn't necessarily cancel the order. If you ever want to give the PC an extra turn of speed, shove in an SSD. That's the best upgrade nearly anyone can make these days.

PS... When weighing up the pros and cons of CPUs (such as when comparing socket types!), you can't go far wrong by wading through the specification tables on Wikipedia. Back in the day, these were often inaccurate or had glaring gaps, but now they're very reliable. Find the Celeron table at ***goo.gl/MYKAPA*** and the Pentium table at ***goo.gl/V1qCMv***.



Crowdfunding Corner

Struggling to find the right camera for your specific needs? Maybe Kickstarter can help. This week, we're featuring two different cameras, neither of which you can get anywhere outside of Kickstarter

Sphericam 2

Virtual Reality – and specifically, VR headsets – are getting large amounts of press lately as they get ever-closer to coming on the market. It's no surprise, then, that there's a growing appetite for hardware that works with VR devices. The Sphericam 2 being the perfect example of that. Essentially, this is a 360° camera that allows you to capture a snapshot or video of an entire environment without any blind spots, which you can then play back or display in VR to give a fully immersive experience. It's compatible with the Oculus Rift, the Samsung Gear VR and Google Cardboard, as well as more convention devices like phones and tablets, and gives any home user the ability to easily create VR content.

About the size of a tennis ball, the Sphericam 2 contained six balanced and synchronised cameras to capture the world in 4K resolution. Sculpted from durable anodised aluminium, it's far from fragile and can be held and mounted in a number of ways, including on a set of provided legs. Wi-fi and streaming are built in, there are six microSD slots (one for each camera) and a remote control app.

The only downside? It's not cheap. In fact, it's *very* not cheap. There are a couple of early bird tiers, but full price is $1,699 (£1,087) for the camera in green, black or silver with case, legs, two mounts and a monopod stick. You'll also have to pay exact shipping when it's ready in December. Despite this, it seems likely to meet its target so if you're interested, there's nothing getting in your way.

kck.st/1BZC1ai
Funding Ends: Thursday, July 30th 2015

IndieVice

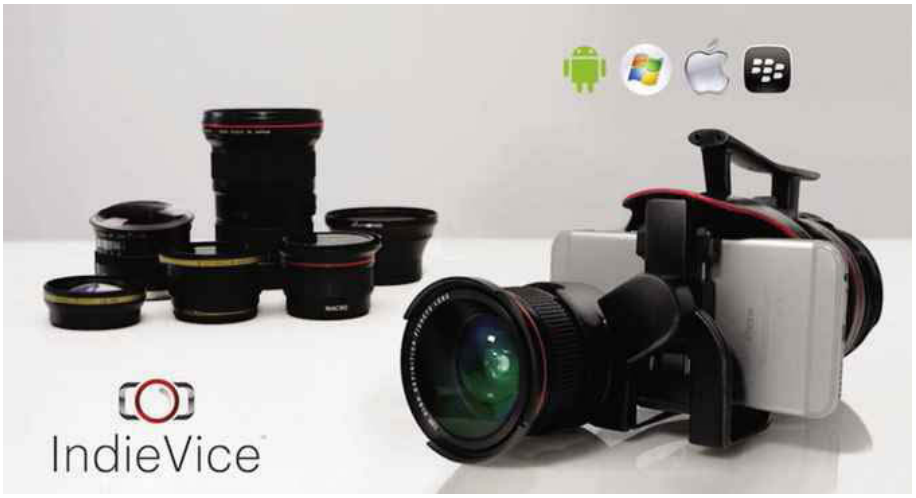
Taking a few steps back down towards the more affordable end of the spectrum, the IndieVice is a conversion kit that aims to turn any smartphone into a professional camera, of sorts. Obviously, there's nothing you can do to upgrade the CMOS sensor in your phone, so that's fixed, but the IndieVice allows you to attach full-size lenses that can dramatically increase the zoom your phone is capable of and help to funnel enough light to the sensor in order to create a much-improved image.

The adaptor is universal, and thus fits any size or shape of phone and it all uses Bluetooth to sync with your phone's camera application. There are tonnes of other attachments too – so that you can potentially improve its performance as a video camera, add an external viewfinder, add a boom mic – it even supports GoPro cameras, if they're your thing.

The price, certainly compared to the cost of a new phone, is quite reasonable – you can get your hand on this kit for as little as CAD$145 (£74). That will get you an IndieVice Pro with Bluetooth remote, at a price that the makers reckon will be 40% less than it'll be charging in the shops. By the time you read this the team will have will have probably met its goal, which is great. Despite this, the devices themselves are not scheduled to ship until March 2016, which means you'll have a bit of a wait before you can get snapping.

kck.st/1dyN2DO
Funding Ends: Wednesday, July 29th 2015





Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Cluster

We look to share our images with a higher level of security this week

Oddly, considering the unimaginable amount of photos we take with our smart phones there aren't many apps out there that are designed purely to allow you to share them securely. Or if there are, they're not quite as secure as you're expecting or as easy to use as they first appear.

Sure enough, there are some that will allow you securely message an image to a contact or a group of contacts or even incorporate some of the privacy functionality found in Facebook. But to actually be able to create your own secure group space, based on the contacts you specify, you'd have to seek the help of the sharing functions within one of the better cloud storage solutions.

And considering recent events, secure images taken from a smart device are something we could all do with looking into.

Create A Cluster

Cluster, from Cluster Labs Inc., is trying to break the users away from the cloud storage solution to securely sharing images and such through its newly updated app.

Cluster is a streamlined release that puts the user back in control of what they want to share and who they want to share it with, and it adds the ability to include location and time/date specific details.

Essentially, all you need to do is download and install the Cluster app, create an account, create a group space – which is called a Cluster, hence the name – then add the people who you want to share the Cluster content with.

An email will then be sent out and the contacts in question can gain access to the Cluster and contribute to it themselves. It's extraordinarily easy and adds a level of privacy to a social sharing theme, as the only people who can see what's posted are the ones you have specifically invited to the Cluster.

Additionally, you, as the one who set up the Cluster, will automatically receive notifications when the people you've invited join and post new items themselves or comment on one of the images in the Cluster.

Possible Uses

There are a number of uses where Cluster comes into its own: for example, friends who want to share pictures from a night out without having to nail down the privacy settings in Facebook or Twitter just for that photo album; new parents, who want to share their new arrival with family members; and how about a newly married couple who want to get hold of every possible photo of their special day from all who were invited?

Needless to say, there are many more potential uses, and what they may be is purely up to you, of course.

Conclusion

Cluster is simple, easy to use and doesn't require you to fiddle around with too many privacy settings. Sharing your content with small groups, each which are indistinguishable from the next, is a clever strategy and probably the way more apps and the bigger web-based social media sites will eventually go.

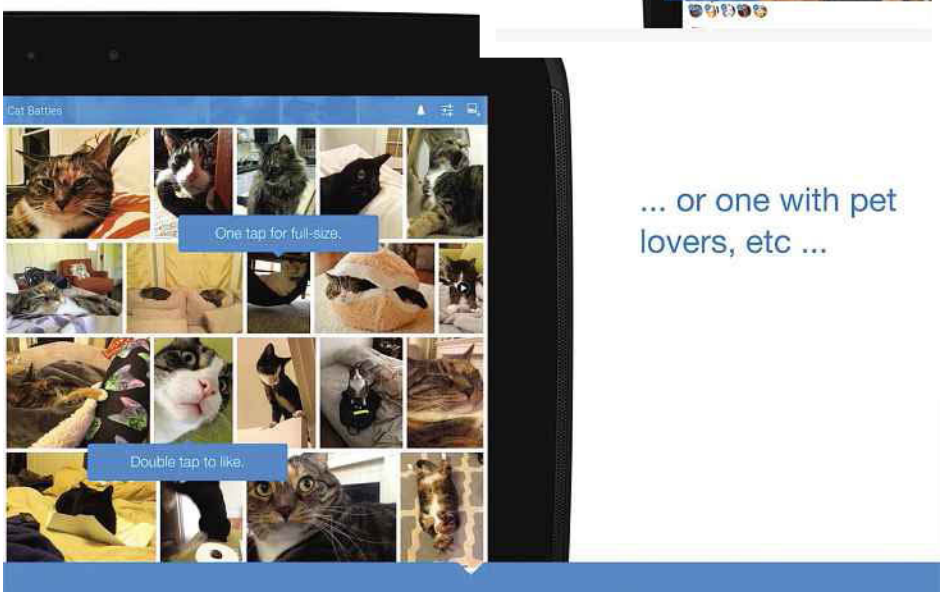
If you have the need to securely share your photo collection, without offending your other contacts, then Cluster will fit the bill perfectly. **mm**

Features At A Glance

- Private and secure: only invited members of the space can see what you post.
- Free.
- An app for everyone: award-winning apps for Android, the web and more.
- Relevant notifications: know when people you invited post new things to the space.

Creating secure photo or video group spaces with your contacts is remarkably easy with Cluster





Even cats love Cluster

Logging Off

With just a month now to go to Windows 10, there's an odd calm that's descended over Microsoft, rather than the usual cheerleader antics we've come to expect ahead of a new Windows launch.

Perhaps that's because Satya Nadella is now in charge, not the shy and retiring Steve Ballmer, but it might also be because of a curious memo that Microsoft's beloved CEO sent out to his staff just recently.

It was one of those 'state of the union' pieces that he's almost forced to issue as the new financial year approaches, and not intended for public consumption. However, someone in Microsoft considered it sufficiently concerning to leak it, and since then all manner of technology pundits have been dissecting it furiously.

Nadella uses very convoluted ways of communicating, but I can't help but salute a man who can work "inter-connectedness", "instantiation" and "unconscious bias training" into any sentences.

But the part that got people really stoked up was, "We will need to innovate in new areas, execute against our plans, make some tough choices in areas where things are not working and solve hard problems in ways that drive customer value."

The phrase "areas that aren't working" seems unnecessarily vague, given the scope of Microsoft's numerous weak spots, but many have taken this to indicate that he's going to kill off the phone side of the business.

I'd contest that he could have equally been talking about Bing, Xbox or Surface, but when employees saw that, I'm sure some of them felt distinctly uneasy.

Whatever he has planned, it might very well have happened by the time you read this, because its financial year end is July 1st.

The reason I'm not yet willing to read this communication as a manifesto to end the Lumia range is that Microsoft has been hard at work building an integrated lattice of technology, of which the phone is an important part.

Once you knock the phone out, then you might as well stop Surface too. And with that out of the way, what exactly is the point of Universal Apps?

With the phone gone, the only role for Microsoft in the mobile space is to create its own apps on Android and IOS, relegating this company to a third-party developer status.

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The way that everything connects, once you pull on one, like a loose end on an old cardigan the whole thing tends to unravel. Yet I'm not sure what else Satya's really supposed to do, because his allegiance isn't to the Microsoft employees but its stockholders. As a rule, they like growth, not contraction or stagnation, however elegantly those things are presented.

At this time, while the number of phones it sells is growing, in the greater scheme of things its market share is declining, and with less than 3% overall share it's a business going nowhere fast.

But it's not the only part of Microsoft that's in retreat, so which to you pull the plug on first, and where will it leave the global 'One Windows' strategy?

We're rapidly approaching the point where, as Satya puts it, 'tough choices' are made, and I wouldn't assume that he's prepared to keep flushing Office and Windows profits downstream, as it's done with Bing and Xbox for many years.

Lumia is looking down the barrel now, but will another division get shot first?

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: **1** Wave, **3** Tertiary, **9** Rancour, **10** Annul, **11** Alliteration, **13** Trauma, **15** Frusta, **17** Phonologists, **20** Shout, **21** Situate, **22** Lenz's Law, **23** West.
Down: **1** Warranty, **2** Vinyl, **4** Errors, **5** Traitor's Gate, **6** Amnions, **7** Yale, **8** Forty Minutes, **12** Rap Sheet, **14** Ashdown, **16** Plasma, **18** Share, **19** MSQL.

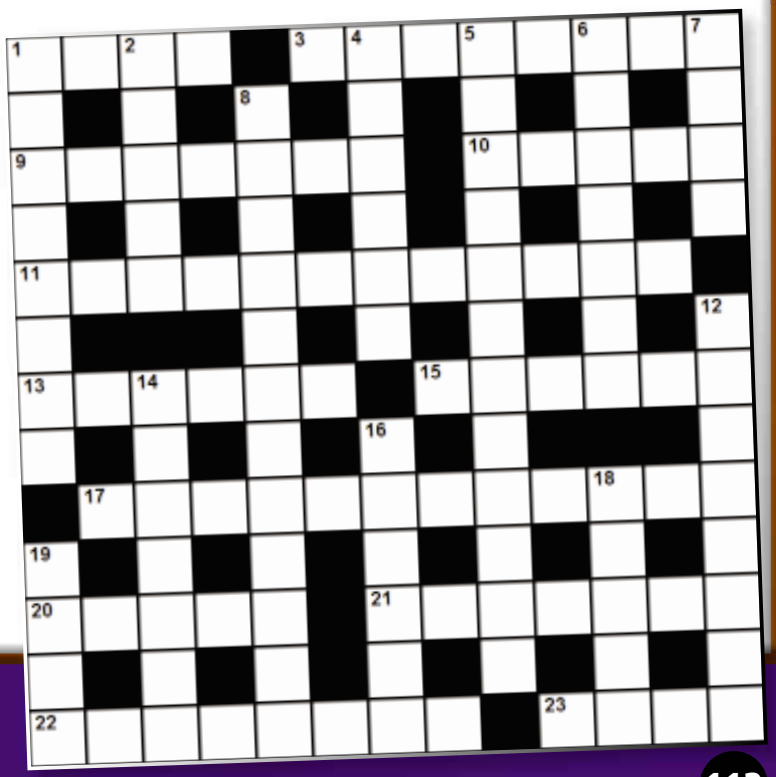
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Sweltering. Surely there is no better word to describe the weather this week, at least in the south of England where we're based. The sun was well and truly out, and the heat went far beyond what one might consider pleasurable, into something approaching torture. No matter how many windows were opened, we simply could not escape the heat. Thankfully, though, this being the UK, forecasters were soon predicting a storm, and sure enough, by Thursday, it had started raining – just in case we were in any doubt about which country we live in. But then we had a bit of a dilemma. It was raining, but it was still quite warm. What should one wear in such a climate? Are shorts acceptable when you're holding an umbrella. And what about sandals? Maybe some combination of summer and winter clothes is needed, like swimsuit and welly boots. Or a raincoat and flip-flops. Or maybe we should just no go out at all and instead wait until the weather can actually make up its mind and be one thing or the other.

THIS WEEK'S CROSSWORD

Across
1 CTRL + C (4)
3 Verbal commitments by one person to another agreeing to do (or not to do) something in the future. (8)
9 The physical properties, phenomena and laws of something. (7)
10 The designation adopted by British military intelligence in 1941 for wartime signals intelligence obtained by code-breaking. (5)
11 Sid Meier's turn-based strategy game series in which you attempt to build an empire to stand the test of time. (12)
13 XXX (6)
15 The sacred texts of Zoroastrianism, compiled in the 4th century. (6)
17 In mathematics an instance of topological equivalence. (12)
20 Del Boy's lurid green Ford car type. (5)
21 Displayed on a full edge of a GUI desktop and used to launch or monitor running applications. (4,3)
22 A market in which there are many buyers but only one seller. (8)
23 Immediately, now - usually used in medical situations, to connote extreme urgency. (4)

Down
1 The maximum amount that can be contained. (8)
2 Broadcasting in which viewers pay by subscription to watch a particular channel. (3,2)
4 Alter the dimensions of something. (6)
5 At 29,028 feet it's the highest point on earth. (5,7)
6 Humorous TV dramas based on situations that might arise in day-to-day life. (7)
7 A protocol for exchanging XML-based messages over computer networks, normally using HTTP. (Acronym) (4)
8 A phosphorescent light seen hovering or floating at night on marshy ground, thought to result from the combustion of natural gases. (4-1-3-4)
12 A gambling card game in which players hold two- or three-card hands, the winning hand being that giving the highest remainder when its face value is divided by ten. (8)
14 A quantum number related to the strong interaction. (7)
16 A high explosive consisting of a mixture of TNT and ammonium nitrate. (6)
18 An automatic pattern of behaviour in reaction to a specific situation; may be inherited or acquired through frequent repetition. (5)
19 An attempt to defraud a person or group after first gaining their confidence. (4)



Top 5 Annoying Keyboard Keys

Aptly, these really push our buttons...

1 The Caps Lock

There are only two kinds of people who use the Caps Lock: those who hit it accidentally when they mean to press the Tab key – and morons. Spend enough time on any social network or internet forum, and eventually you'll encounter SOMEONE WHO WRITES EVERYTHING LIKE THIS. It's hard to read, and it looks like they're shouting. So why do we need this key? Surely no one with two brain cells to rub together uses it deliberately? Even if they do, they're probably in the minority, so why not just put it somewhere more out of the way – like in a different room.

2 The Windows Key

Okay, this key is actually genuinely useful most of the time, because it opens the Start menu in Windows, as well as enabling all kinds of useful shortcuts (like Win+P to cycle through your external display options). But it's also the one of the most irritating keys ever invented if you're a gamer. Accidently press it when you're playing instead of, say, the Ctrl key, and your game will helpfully minimise itself, leaving you staring at your desktop while everyone else in *Call of Duty* uses you for target practice. It's so bad that many gaming keyboards enable you to turn it off.

3 The # Key

Thanks to the rise of Twitter, the # key has become an important part of online communication – which is odd because no one can seem to decide what it's called. Is it the hash key? Or the pound? Or maybe it's the number key? Whatever it's called, you better pray you can actually find the damn thing, because a lot of keyboards don't have it marked clearly. And even if they do, regional differences might mean the key with the # on it doesn't actually create that symbol. Great...

4 The @ Key

Perhaps it's a bit unfair to blame the @ key itself for this, but why can't keyboard makers just keep this in the same place? The reason, of course, is that the USA layout differs from the UK one. As standard, the UK puts the @ key next to the colon, and you access it by pressing Shift and the inverted comma. Do that with an American layout, though, and you get quote marks, so ' becomes ". Now this might be controversial, but the American system, with the @ on the '2' key works better. Either way, considering how much use this key gets, you'd think we could all just agree on one system.

5 The Any Key

Legendary among Micro Mart readers, the Any key is a riddle wrapped in an enigma wrapped in a puzzle wrapped in a slice of bacon. Yes, generation upon generation has tried to pin it down, but it has always managed to elude detection. In spite of an absence of proof, though, rumours of its existence persist, and it has become a source of both intrigue and mirth, with references to it appearing regularly in the Micro Mart caption competition.

Why is the Any key annoying? Because we can't find it, and our Windows 95 PC has been waiting nearly 20 years for us to press it to continue.



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